Cemented Steels Perfected

Formed by pressing powdered iron or steel into compact and infiltrating molten-copper alloy. Low-cost materials produce strong parts

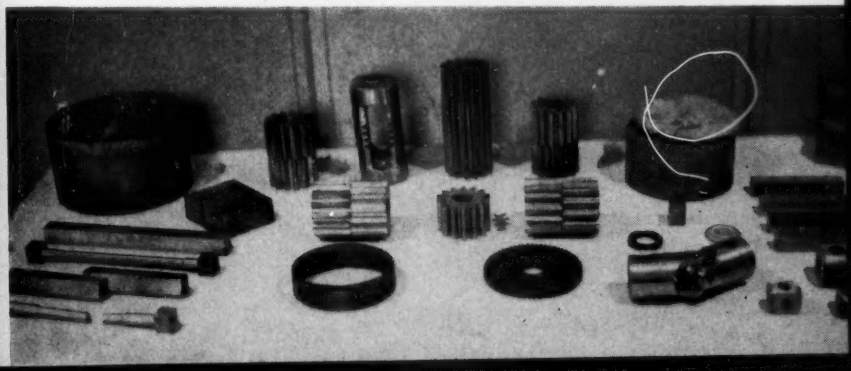
Latest success in powdered metallurgy is the production of cemented steels by compressing the particles until they form a porous compact and then infiltrating a molten copper alloy, the cementing agent, by capillary attraction. The compact is placed in contact with the copper alloy and heated in a furnace to just above the melting point of the alloy. This usually is done during the sintering operation required to strengthen parts shaped from the pressed iron or steel powder.

These Sinteels perfected by American Electro Metal Corp. reportedly make possible the production of dense, strong (185,000 psi. tensile) metals from low-cost materials at relatively low pressures. And the parts retain the characteristics of both the copper and the parent metal, permitting brazing directly to other metals without a brazing alloy, facilitating plating, retarding corrosion, and providing bearing qualities for gears and cams. Acid will dissolve the copper from the face of the part to any desired depth, and the porous surface will retain lubricant.

Present practice is to use low-cost iron or steel scrap, which can be pulverized without becoming too fluffy—domestic reduced irons of low oxygen content and high apparent density, Swedish sponge iron, decarburized steel scrap, decarburized cast-iron shot, or combinations. Powders of these materials cost 8 to 12¢ per lb. The copper-base alloy infiltrated —about 15% tin, silicon, chromium, and other materials—costs about 20¢ per lb. Ratios of iron to copper in the cemented steels range from 75:25 to 85:15.

Special alloys for infiltration where exceptional strength or wear resistance is required are in prospect. In experiments, powdered and pressed stainless steel has been infiltrated with copper and silver.

The surfaces obtained by the cementing process resemble those of die castings; if especial smoothness is wanted, subsequent finishing may be necessary. Progress to date indicates that the process will be most applicable for parts weighing from a few ounces to 20 lb. A normal pressure requirement is 20 tons, but where very close dimensional control is desired, the higher pressures common to other forms of powder metallurgy must be used, perhaps followed by pressing after sintering. —BUSINESS WEEK



Cemented steel products range from a heavy disk (left) to small rings. Long gear (center) is 2 pressed gears combined by copper infiltration. Disk at upper right has copper alloy residue on top; it lifts off easily because during baking the alloy is separated by a layer of sand.

Better Textile Methods

Over 75 reports on German textile technology disclose some superior methods in finishing, printing, synthetics, and spinning

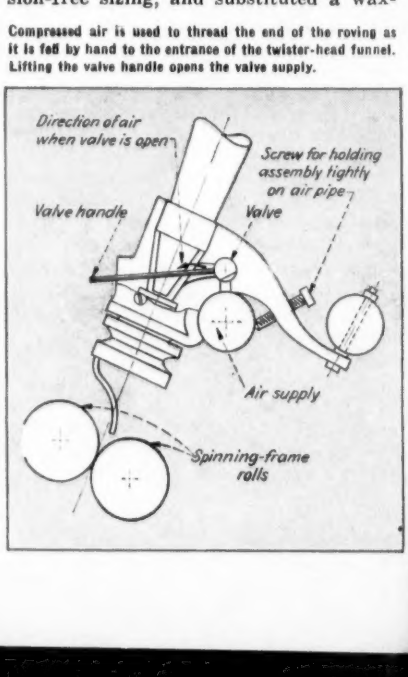
Finishing—In cotton dyeing, to improve penetration of dye liquor into fiber, a third beam roll between the two regular ones is brought to bear on the cloth by means of end-ratchets and a crank. Some mills claim better results and more even shades as a result of enclosing jigs in glass-windowed cases. One rayon mill developed a Monel-lined 315-gal. dye box with steam and water lines in a trough down the center. The box's front section is raised up and the pin rail placed at front. Depth of box from front to back is foreshortened by width of color section. Color and chemicals are placed in a large funnel connected to steam line, and steam is injected.

A long drying frame is a combination of pin and clip, and is equipped with automatic overfeeds for the pins, electrical guides, and width regulators. Cottons are run on the pins for shrinkage control, with adequate results but not approaching that of Sanforizing. One mill used a net dryer with individual motor drive for each tier. Controlled by a roll hung between the tiers, the motors adjust speeds as the cloth shrinks or becomes slack.

Printing—New "Astrazon" colors—yellow, orange, pink, red, and blue—possess added light-fastness and brightness, are readily soluble, fast to sublimation, and of high yield. After printing with Astrazons and drying, prints are steamed (45 min.) without pressure, then after-treated (10 min.) in a bath containing 3-5 gm. of Katanol WL per liter, rinsed well, and dried. Printing textiles through screens with patterns developed by photographic processes yielded some exceptionally fine work. Screen coatings which combined a photosensitive layer and a strengthening lacquer were of two types. One is based on the oxidation of a polyvinyl chloride coating by the action of light on ammonium bichromate. The other employs saponified polyvinyl acetate which, after exposure to light, is hardened by immersion in a mixture of formaldehyde and butylaldehyde.

Synthetics—Long-staple acetate was used by the Germans on the worsted system to produce a yarn very similar to wool. Steps in the manufacture were: 1 carding 2 gilling, 1 combing and 1 gilling, at 80% humidity and 72° F. By using the long-staple acetate (2.36-in.) on the cotton system, yarn of worsted character, with fiber of 4.0 den. spun to 20s counts, was prepared. To meet the problem of high elongation in wet- and spun-rayon yarns, they devised lattice arrangements for air-drying and tension-free sizing, and substituted a wax-

Compressed air is used to thread the end of the roving as it is fed by hand to the entrance of the twister-head funnel. Lifting the valve handle opens the valve supply.



consistency mass for the water-sizing solution. In this process, a heated size-box is connected with heated squeeze rolls, and an air passage of 6½ ft. replaces the dryer. A sizing compound (called "Tylose") made of water-soluble cellulose ethers and cellulose gycollic acid produced excellent results with spun and filament rayon, as well as with wool, cotton, linen, cottonized flax and jute. PC fiber (after-chlorinated polyvinyl chloride) produced fabric found to be highly resistant to water, acid, alkali, oils, bacteria, mildew, and sunlight, although it softens at 176° F. These fabrics were widely used in filtration.

Spinning—In one mill, a system of drafting and a type of creel are fitted to the spinning frame above the roller beam to adapt the frame for spinning from condenser roving. New devices incorporated in spinning machines include: an automatic weighpan feeder for staple-rayon cards, and combs in place of the usual doffer rolls on such cards; an air suction device supplanting the scavenger roll for picking up ends broken in spinning; a card-cylinder drive with differential transmission; cotton-frame cylinders built up by a series of bucket-like steel sections welded together, and located on the side rather than in the center. —TEXTILE WORLD

SMOKE TROUBLES

Of 2,200 small power plants surveyed recently, only 8 were found in first-class operating condition, 15% had minor defects and were well-operated. Two-thirds of the plants had operational difficulties, with incorrect firing heading the list.

Firing faults were: lack of method, unnecessary stirring of fire, overloading the firebox, trying to force a cold boiler, poor maintenance and housekeeping, and accumulation of soot and flyash in gas passages, breechings, and chimney.

Common failings leading to smoke trouble include: (1) lack of means whereby the fireman can see the stack to detect smoke, and (2) assigning the fireman so many duties he has no time for proper operation and maintenance.

TELEVISION ENLARGER—American Optical Co.'s new lens-mirror combination makes television pictures 5 times as large as prewar. Reflecting glass mirror at right enlarges pictures from the television tube but introduces aberrations, as indicated by reflected image of girl. The specially curved glass lens at left corrects the distortions in the image. —ELECTRICAL MERCHANDISING

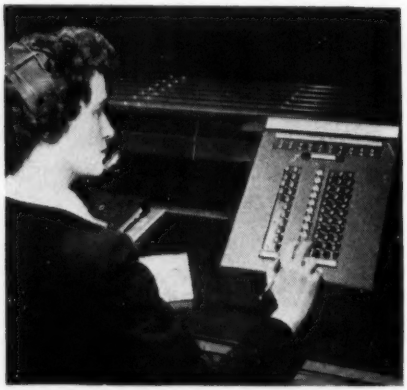
Only about 25% of combustion-control and metering equipment was being operated properly. Many instruments were disconnected or couldn't be read; others had been tampered with so results were no longer dependable. Another common source of difficulty was in lack of co-operation between boiler room and steam-using departments, causing unnecessarily heavy and rapid loading of boilers and combustion troubles. Better mixing of furnace gas and air with steam or air jets could take many plants out of the violator class. —POWER

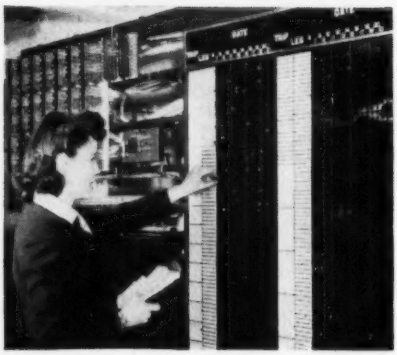
CARBON WHITE

A white powder experimentally produced by B. F. Goodrich Co. substitutes for carbon black to permit the manufacture of rubber products in white or bright colors. Ethyl silicate, chemically made from sand and alcohol, is burned, and superfine translucent particles of the same size and shape as carbon black result. —BUSINESS WEEK

FLYING FREIGHT TRAINS

Strings of freight-carrying gliders will be towed by a cargo plane in a commercial air-transport service operated by Winged Cargo, Inc., if the Civil Aeronautics Authority approves after a 4-month test of single tows. The first flight was nonstop from Philadelphia to Miami and then overseas to Cuba and Puerto Rico, a C-47 plane pulling a CG4-A glider. Flights to South America and Europe are planned. —BUSINESS WEEK





RESERVATION TELL-ALL—When a passenger requests an air-travel reservation of one of the 36 agents in American Airlines' Boston office, the agent punches keys for the desired date, flight number, and flight leg on a keyboard (above). In less than 1/5 sec., a light flashes to indicate whether the space is available. On the electric control board (below) is a jack for each flight leg for each of 16 dates. When the space is filled, an operator inserts a plug in the corresponding jack. The keyboard operates relays to set up circuits to the board. —AIR TRANSPORT

DEHYDROFREEZING

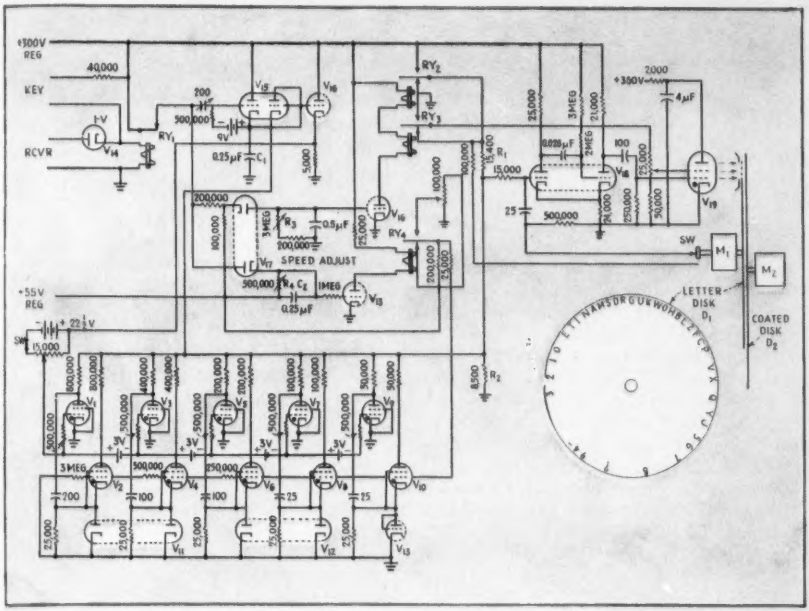
Preliminary experiments with several fruits and vegetables have shown that moderate dehydration (removal of about 2/3 of water content), followed by freezing at −30° F. and storage at −10° F., results in excellent, easily "reconstituted" products in most cases. This new method saves weight, space, packaging materials and refrigeration load. High-altitude freezing of foods sent by air may be practicable. —FOOD INDUSTRIES

COPPER-LEAD SEPARATION WITH SULPHUR DIOXIDE

In a new method for separating copper and lead from a bulk galena-chalcopyrite, the concentrate from the lead-flotation section goes to a settling cone and thickener, then to a concrete-lined agitator where starch, zinc hydrosulphite, and sulphurous acid are added and stirred for 15 min. Hydrated lime is added later to give a pH of 6 or 7, and the chalcopyrite floats while the galena and sphalerite are depressed. Four 24-in. "rougher" cells, one intermediate cleaner, and one 18-in. final cleaner make up the flotation unit. Tailings of the rougher section constitute the final lead flotation concentrate which is pumped to the lead filter section. The copper concentrate from the final cleaner is sent over a table, and the tailings go to the copper filter section. Total copper recovery, 74%.—ENG. & MINING JOURNAL

GENERATORS FOR RUSSIA

Reported to be the largest in physical size ever built, the first of three 90,000-kva. hydroelectric generators for Russia's Dnieprostroi Dam has been shipped by General Electric. The frame diameter is 42½ ft., the weight more than 2,250,000 lb. The new generators, 16% larger than the ones wrecked, are expected to operate early in 1947. —ELECTRICAL WORLD



CODE TRANSLATOR—International Morse code, or any arbitrary code, is converted into visual images of the letters and figures by a new electronic code translator which couples to the output terminals of a radio receiver which produces the code audibly. It consists of two sections: (1) a discriminator, in which 5 or more pairs of thyratrons employed as reset relays in a scaling circuit produce, after each group of dots and dashes, a unique voltage determined by the character received; (2) an indicator, functioning on the stroboscopic principle, that converts discriminator voltage, at the proper time, into a persistent optical image of the character on a moving phosphorescent screen. Portions of the circuit are gated, so that the thyratrons are returned to the ready condition after each character has been presented, and so that the stroboscope is illuminated only at the proper time. Tubes V_1 to V_{10} are type 2050; V_{11}, V_{12}, and V_{17}, 6H6; V_{13}, V_{15}, V_{16}, V_{18}, 6SN7; V_{14} is a 1-V; V_{19}, a Strobotron. —ELECTRONICS

HONEYCOMB HOUSE

Newest prefabricated house is built of standardized panels 2 in. thick and consisting of 2 thin-gage aluminum sheets with a honeycomb core of kraft paper impregnated with plastic. The 24 x 28-ft. house weighs but 2,000 lb., exclusive of the concrete floor, and the cellular structure combined with the reflection of heat by the metal sheets gives high insulating value.

Put together with screws and flanges, the panels support the roof, also fastened with screws. Cost is about $3,000 including plumbing. Erected at Marion, Va., the house was designed by C. C. and John D. Lincoln. —BUSINESS WEEK

AERIAL PROSPECTING

So sensitive that it is credited with detecting, from an airplane flying 200 mph., magnetic variations caused by the presence of 1,500 tons of metal 10 ft. or more below the surface, the improved magnetometer has great potential value in prospecting. Rapid, inexpensive, comprehensive surveys to detect geophysical oil structures and ore veins are possible with it. —BUSINESS WEEK

Nuclear Engineering

Experience at Oak Ridge suggests that the electromagnetic separation method would serve for commercial separation of isotopes

The electromagnetic process for the concentration of Uranium 235 at Oak Ridge is basically a modification of the mass spectrometer in which a suitable compound of uranium is vaporized, then ionized by passing through an electric arc. The electrified atoms are given a high velocity by increased-potential electric fields, and are caused by a strong magnetic field to travel in a circular path whose diameter is a function of the mass of the atoms. The lighter U-235 atoms, travelling on a smaller d.ameter than the U-238, are collected in pockets at proper points in the circular path.

Construction and equipment has a value of $427 million, and the 175 buildings provide a working floor-area of 4,500,000 sq. ft. The 250-ft. electromagnets have many parallel circuits, the heat generated being carried away by transformer oil through heat exchangers. Chambers in the air-gaps of the electromagnets are evacuated (by enormous diffusion pumps) to one-25 millionth of standard power-plant condenser vacuums, so that the uranium atoms will not collide with other atoms. The magnets exert such a pull on shoe-nails that walking is difficult at some points.

On high-voltage circuits, cooling water which is continuously deaerated and deionized is used to secure adequate insulation.

Uranium and its compounds absorbed water, tended to revert to the oxide, and combined chemically and physically with metallic parts of the equipment. Elaborate processes had to be developed for separating and recovering the uranium. Even wash-water from operators' uniforms, the uniforms themselves, and the ventilating air were processed for uranium dust. Carbon parts, used to protect metal from beam impingement, frequently had a life of only one run, and all carbon used was burned for uranium recovery.

The electromagnetic process should have almost unlimited scope in the development of atomic power, and would be most versatile in isotope separation in industry. —CHEM. & MET. ENGRG.

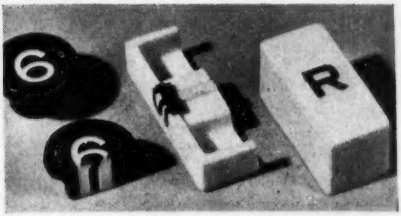
ALTIMETERS MEASURE DRIFT

In thick weather when the driftmeter is inoperable, an airplane navigator can determine drift with a pressure altimeter and a radio, or absolute, altimeter by taking simultaneous readings of the two at two different points along the track, preferably at half-hour intervals. With the plane flown at a constant pressure altitude, the radio altimeter will indicate whether the flight is from a low- to a high-pressure area, or vice versa. In the Northern Hemisphere, the wind blows counter-clockwise about a low-pressure area, clockwise about a high one, so drift is to the right going from high to low, to the left from low to high. Amount of drift is a function of wind velocity, and this increases proportionately with increase in the pressure gradient. A correction is applied for head- or tail-wind velocity. —AIR TRANSPORT

FLUORESCENT MAINTENANCE CAN BE A BUSINESS

There is a business opportunity for the electrical contractor in the periodic maintenance and cleaning, on contract, of commercial and industrial fluorescent lighting. Fluorescent lamp outages average as high as 10%, and thousands of dollars are spent each year for light that is absorbed by dirt on the lamps, fixtures and reflecting surfaces.

The contractor should agree to: (1) Keep customer's fixtures in good elec-



BUILT-IN LETTERS—Numbers, letters, and other designs are built into plastic products with a new Electric Mfg. Co. process, eliminating the less permanent filled embossing, hand painting, or decalcomanias. The method involves injection molding in such a way that one plastic hardens before the second is injected. —BUSINESS WEEK

trical operating condition. (2) Replace lamps, starters, ballasts, or other parts on notice. (3) Clean fixtures at a certain stated interval. The charge is based upon a fixed rate per lamp per month, ranging from 16 to 25¢.

Unnecessary service calls can be reduced by replacing all lamps which appear to be well along in life when cleaning is being done or when a fixture is serviced. —ELECTRICAL WHOLESALING

ALONG WORLD'S AIRWAYS

Regular service between New York and Amsterdam via Gander was started on May 21 by the Netherlands Government Airline with 17 DC-4's. . . . Trans-Canada Air Lines hopes to fly between Toronto and Chicago, Toronto and Cleveland, and Victoria, B. C., and Seattle early in July. Its total of 5,299 route miles probably will be increased 67% this year. . . . With 11 DC-3's in regular service and more than 100 new transports on order, Air France plans are well under way for coverage of Europe and Africa, with direct lines connecting Paris with New York and radiating to points as far east as Indo-China. —AVIATION NEWS

Regular air freight shipment of frozen clams in 20-lb. cartons and unfrozen clams in prechilled special containers has been inaugurated between Boston and the West Coast. . . . Pan American has resumed air service from the West Coast to New Zealand with stops at Hawaii, Canton Island, Suva and Noumea. Douglas DC-4 Clippers will halve prewar flying time. —BUSINESS WEEK

PUSHBUTTON HOME—Pushbuttons operate small relays, or solenoid switches, in the outlet boxes to control the lights in a model home in Los Angeles. Any number of buttons can be connected to one relay to permit control from every doorway as well as central control in the master bedroom for use in emergencies. Elimination of conventional switch "legs" more than pays for the system, advocates say. The simple elements of the low-voltage control system (the wires need no protection) are shown in Fig. 1, the multiplicity of controls in Fig 2. One side of all relays is connected by a common wire to a low-voltage transformer secondary, whose other lead is attached to a common wire extending to one side of all buttons. The other side of each relay is connected to a terminal block and across the block to all buttons operating a particular relay. The master-bedroom control is connected on one side to the common wire from the transformer and on the other to the terminal block. —ELECTRICAL WORLD

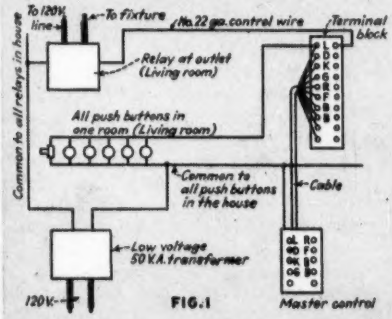


FIG. 1

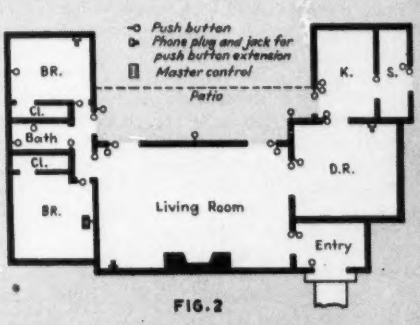
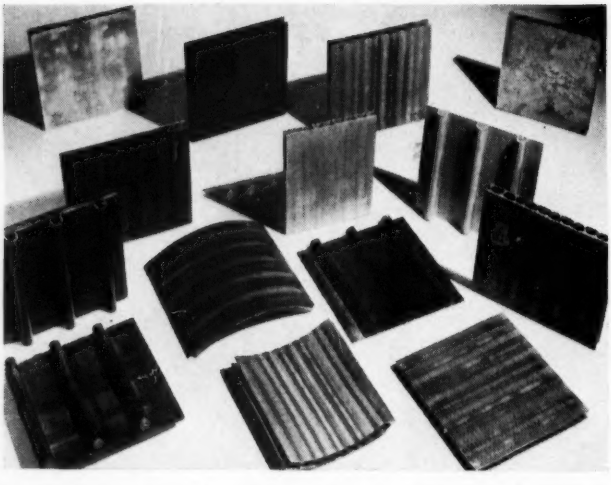


FIG. 2



LIGHT STRUCTURES—Corrugated cellular laminates of paper, cotton, fabric, glass textiles, aluminum, steel and plywood have been produced by Studebaker in a 1-step process. Panels can be made to various shapes and provide great stiffness. "Sandwiches" are built up over cellophane sandbags, this filler being blown out with an air hose. —PRODUCT ENGINEERING

ANCHOR FOR AIRPLANES

A spike fired from a bazooka-like tube as a light airplane comes in for an emergency landing in a small field buries itself in the ground and anchors one end of a nylon rope, the other end of which is attached to the plane. The rope brings the plane to a quick stop without ground looping. All-American Aviation has successfully tested it. —AVIATION NEWS

HYDROCARBON HYDROGEN

For continuous, low-pressure production of hydrogen from natural gas, refinery gas, propane or butane, the sulphur compounds in the hydrocarbon are first removed by caustic scrubbing, or by passing the material over bauxite or metallic oxides at high temperatures. The hydrocarbon is then mixed, over a nickel catalyst, with steam in a furnace at 1500° F., and carbon oxides and hydrogen are produced. The gas mixture, cooled by steam to 750° F., is passed over an iron oxide catalyst to convert the carbon oxides to CO_2, and this gas is then absorbed in monoethanolamine. For high purity, the conversion and absorption process is repeated, and the resulting 99.9% pure hydrogen contains less than 0.01% carbon oxides, less than 0.1% hydrocarbon. The carbon dioxide is recovered. —CHEM. & MET. ENGRG.

ELECTRICAL INSULATION WITHSTANDS CHEMICALS

Immersion for 55 days at room temperature in concentrated hydrochloric acid, 50% nitric acid, concentrated sulphuric acid, 30% chromic acid, and 46% sodium hydroxide solutions changes the weight of polyvinyl chloride electrical insulation only 1 to 6%. Immersion in water for 3 years caused no appreciable change in the electrical or physical properties. Certain of the compounds flex at −75° F., others are stable at +175° F.

Polyvinyl chloride coated wire is slick, pulls into conduit easily, and strips readily for splicing. Its colors are permanent for identification in complex wiring systems.

Exposed to chemicals and flood water (it is still functioning satisfactorily in flooded conduits), it has given excellent service. —ELECTRICAL CONTRACTING

PULSE-JET RATED BEST FOR SUPERSONIC SPEEDS

Pulse-jet engines, first used on the Nazi "buzz" bomb, show promise of competing with the ram-jet (athodyd) type in power output at supersonic speeds and offer advantages in other respects, according to Dr. J. F. Manildi, chief research engineer for G. M. Giannini & Co. The pulse-jet delivers useful thrust throughout the subsonic-speed range, (athodyd thrust is negligible below 500 mph.), and the fuel rate is about constant, being appreciably lower than that of the athodyd at speeds up to 700 mph.

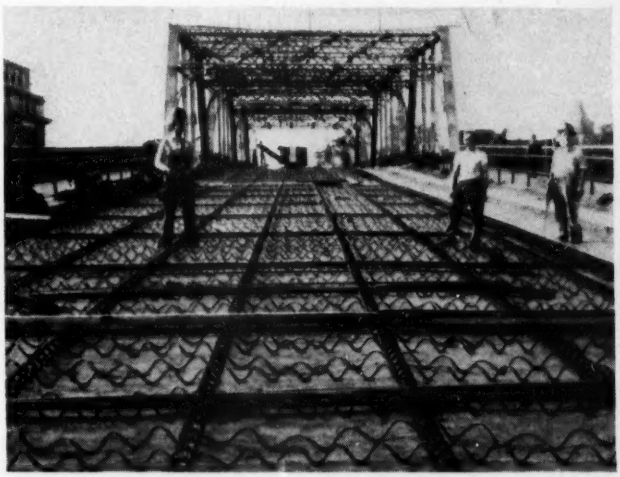
Temperature limitations, Dr. Manildi says, makes the turbo-jet engine inferior to the pulse-jet or athodyd in supersonic flight. —AVIATION NEWS

INDUCTION BRAZING PAYS

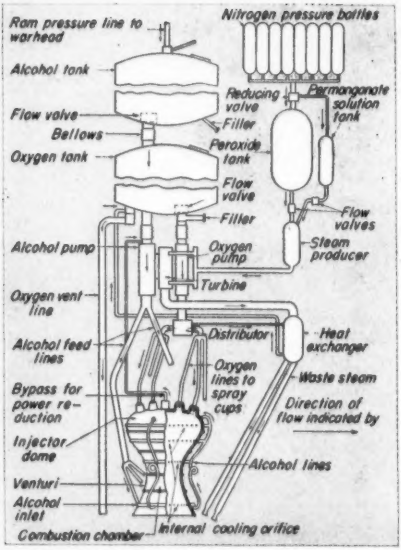
Two 15-kw., 2-station, 9,600-cycle induction heaters have paid for themselves in 3 months at Willey's Carbide Tool Co. where they are used to braze carbide tips to more than 200 types of cutting tools. Output went up 20% in a month, with no more manpower. Certain job costs were cut from $4 to 30¢ an hour. Induction heating avoids removal of excess metal from tool shank; eliminates wiring tip to shank; reduces wear on finish grinders; is cooler and cleaner; provides a more positive, uniform braze; and holds rejects to a fraction of a percent. Big tools are quickly positioned beneath the inductor on a magnetic block. A rotary fixture speeds the brazing operation for small tools. —ELECTRICAL WORLD

COOL AND SUPERCHARGE

An aid to supercharging diesel engines is to cool intake air before compression. Tests of this method indicate it is advisable to provide air intercoolers to reduce temperature of supercharging air to that of the room or lower. The first intercooled turbocharged engine for stationary service in the U. S. went into the Menasha, Wis., municipal plant. Intercooling raised engine rating from 110 to 130 bmep. The method is presently practical only where cooling water is at 80° F. or lower, but a new supercharging cycle will remove heat from air at high temperatures, permitting use of an air-to-air cooler. —POWER



SPIRAL BAR REINFORCEMENT—After removal of old, disintegrated asphalt, a 6-in. concrete bridge-roadway is poured over these spiral bars which are arc-welded to top flanges of longitudinal I-beam stringers and to transverse steel buckle-plates, effecting a bond between concrete and bridge structure. The strength of the reconstructed floor has been increased from 6-8 to 15-ton loading. —CONSTRUCTION METHODS



OPENS NEW FLIGHT ERA—Capable of propelling aircraft at tremendous speeds and altitudes, the German V-2 engine has opened a new era in flight, although it is deficient in economy and reliability. It burns a combination of ethyl-alcohol and liquid oxygen, forced into the combustion chamber by turbine-driven pumps powered by superheated steam produced by rapid decomposition of hydrogen peroxide under catalytic action. Electrically controlled high-pressure nitrogen operates valves in the power section. With an oxygen-alcohol consumption of 276 lb./sec., the thrust is 58,000 lb. at sea level, 64,000 lb. at reduced atmospheric pressure. The V-2 operates at a jet utilization efficiency of about 80% at peak powered velocity of 5,200 fps. Propellants comprise almost 70% of the weapon's take-off weight. —AVIATION

MORE MILEAGE WITH RAYON

Rayon cord increased bus tire mileage 40% on the B & W Lines, and it has reduced heat and impact breaks so much that spares are carried on only 1 of 12 routes. There has not been a single blow-out in over 6,000,000 miles. Mileage on original tires frequently exceeded 100,000, another 25,000 being obtained from recaps. At 200° F. tire heat, rayon loses only 5% of its strength; cotton cord is weakened 23%. —BUS TRANSPORTATION

ELECTRONIC THICKNESS GAGES

Two oil companies have developed units to measure wall thickness of pipe, tubing, pressure vessels and to detect cracks and corrosion.

Texas Co. has evolved the Penetron, which uses gamma rays to measure wall thicknesses up to 3/4 in. within an accuracy of plus or minus 3%. Radium salts are in a needle with directing shield. Rays passing through the wall are picked up by a detector and amplified for transmission to the measuring circuit. The unit will not detect pinholes, pinhole corrosion, fine cracks or laminations.

Shell Oil evolved the Probolog, which detects and records internal defects, as pinholes, cracks, corrosion, and erosion pits, as well as differences in chemical composition of nonmagnetic materials. A unit for magnetic materials is being developed. The device is electronic, but also incorporates a neon blinker when a record is not required. In operation, a probe is pulled mechanically through the tube. —AMERICAN MACHINIST

MAPS MADE BY RADAR

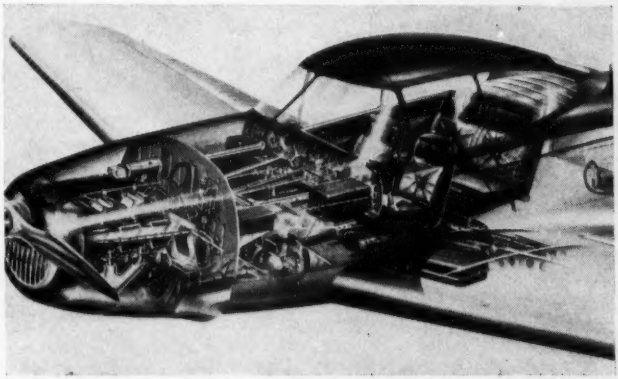
With "shoran", or short-range radar, large sections of the world can be remapped with greater accuracy than by ground surveys. A shoran-equipped airplane sends short-wave radio signals, pulsing at 20 times a sec., to each of 2 ground stations which reflect them back. They are received on the plane radar screen as "pips," or bumps, of light on a thin circular line. A third pip represents the plane, and the operator turns dials until the three pips merge. The exact distance to each of the stations is then shown on dials, in divisions representing only 5.2 ft. The dial readings and the ground below are photographed simultaneously to preserve the "fix" for permanent use. Charts and maps may be drawn from a number of these short-range radio fixes. —BUSINESS WEEK

What's New in Aircraft

New and refined models designed for postwar market. Trend in private airplanes is toward low cost (some under $3,000), economy, reliability

Boeing, noted as a big-plane builder, is going into large-scale production of a smaller transport, the B-417, which seats 20 to 24 and is powered by two 800-hp. radial engines and is designed to meet a need for low-cost operation in short-range feeder-airline service. . . . A backlog of more than 5,000 orders indicates the popularity of Piper's $2,905 three-place, 100-hp., 1,000-lb. *Super-Cruiser* Model PA-12 which cruises at 103 mph. on 6 gal. of fuel per hr., and ranges 600 mi. The upholstered, Plexiglas-window cabin is sound proofed, and the engine equipped with an oversize muffler. . . . Surplus C-54's, equivalent in space to a freight car, will be converted by Douglas into transports with half the cabin heat-insulated and mechanically refrigerated to carry perishables. The vapor-cycle refrigerating machine will be operated from the plane's electrical system in flight, from a gasoline-powered motor-generator on the ground. . . . . Two airplanes now being built by American manufacturers to exceed the speed of sound are expected to fly by Jan. 1, 1947. . . . To reduce costs and increase serviceability, standard automobile electrical equipment will be used on the Republic *Seabee* 4-place amphibian. . . . Aeronca Aircraft Corp. has a 1946 production goal of 10,000 personal planes. Its *Chief* is priced at $2,485. . . . The Douglas XB-43 bomber is powered by two TG-180 axial-flow turbojet engines each rated at 4,000 lb. static thrust and is expected to fly 500 mph., have a 38,000-ft. service ceiling and a 1,400-mi. range. . . . Surplus Taylorcraft 3-place TG-6 gliders are being converted to 65-hp., 2-place, $2,400 airplanes. —AVIATION NEWS

Piper's new 4,000-lb (gross), 4-place, all-metal, low-wing, full-cantilever monoplane is scheduled for large-scale production early in 1947. This *Skysedan* is powered by a 165-hp. Continental E-165-3X; a top speed of 150 mph. and a landing speed of 45 mph. are indicated. . . . Utilizing geodetic "basket weave" construction of spruce covered with fabric, the Thalman *Special* is a new high-performance 1-place personal plane with a 55-hp. Velie radial engine. Rate of climb



American Aviation is testing a 4-place, $6,100 personal airplane with a 185-hp. aircooled Continental engine, top speed of 160 mph., landing speed of 54 mph., a 700-mile range, and a gross weight of 2,570 lb. Of semi-monocue construction, the fuselage structure of this "NAVION" is made as a single unit with two upper and lower longerons extending aft from the fire-wall. —AVIATION

is 1,000 fpm.; service ceiling, 17,000 ft.; cruising speed 125 mph.; landing speed 35 mph.; range, 900-mi. on 27 gal. of fuel. . . . Designed for courier duties, the new military XR-9B helicopter of G & A Aircraft speeds 100 mph. (top), climbs 1,000 fpm. to a 10,000-ft. service ceiling, operates more than 3 hr. on 25 gal. of 80-octane fuel for its 135-hp., 4-cyl. Lycoming engine. —AVIATION

MORE GLITTER FOR AUTOS

Translucent lacquers through which light penetrates and is reflected back have been developed by du Pont to give more glitter to automobiles. This new type of finish is made possible by transferring particles direct from the grinder to the lacquer, simultaneously removing all trace of water. This eliminates the tendency of the particles to agglomerate and grow in size during drying in the customary process. In the past, this has prevented penetration of the light between particles.

The new finishes also embody a new pigment material, ferric hydroxide, which is removed from the water in which it is precipitated and transferred to a lacquer vehicle without drying and producing iron oxide. Along with the ferric hydroxide, aluminum flakes are employed to lend the mirror effect first achieved in prewar metallic finishes.

Tests show that the Metalli-Chromes wear longer than earlier developments in this field, and provide richer colors, but they may cost ⅔ more than ordinary lacquer. —BUSINESS WEEK

HOT AIR

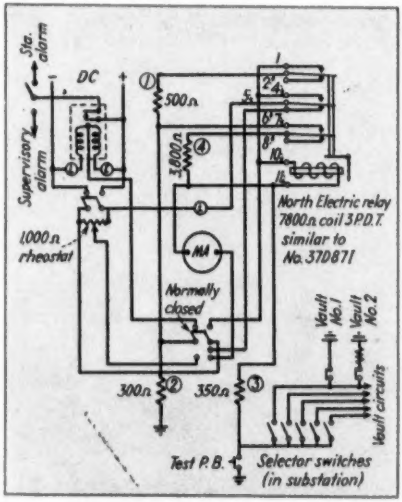
Lightweight refrigeration units are being installed in the P-80 jet-propelled *Shooting Star*. The unit cools the metal skin, which rises 20° F. at 350 mph., 60° F. at 650 mph. —PRODUCT ENGINEERING

The Nazi V-2, reentering the atmosphere at 3400 mph., is slowed to 2600 mph. by air friction before impact. In the process, skin temperature rises to 1300° F. —AMERICAN MACHINIST

NEW BLASTING TECHNIQUE

By shaping a cavity in the explosive and placing that cavity over the point where a concentration of explosive force is desired, 1 lb. of 45% gelatin mine powder will break about 50 cu. ft. (4 tons) of rock composed of garnetized, silicified limestone with some pyrite, serpentine, magnetite, and chalcopyrite. This is an explosive saving of more than 60% over conventional methods.

Tests on the efficiency of this "Munroe effect" indicate substantial powder savings, less burden on the ventilation system, decreased gassy working conditions, and labor saving due to the shaped charges being prefabricated. Typical model charge: hemispherical steel cavity of 1-in. radius in the flat side of a cylindro-hemispherical charge of 1½-2 sticks of explosive. Propped or wedged against



HIGH-WATER ALARM—Southern California Edison Co. developed this circuit to sound a warning when water rises or transformer temperature goes too high in an underground vault on its distribution system. The vault involved is located by a milliameter which measures the resistance of the circuit to the vault when arm switch has been closed. CTRICAL WORLD

rock-face, it is detonated by Primacord or electric detonator. In secondary breakage problems, shaped charges will no doubt replace the difficult methods of plastering and bombing, mud capping and blockholing. —ENG. & MINING JOURNAL

ELECTRO-PNEUMATIC LOOM

In a new patented loom of Brazilan origin, compressed air provides the precisely controlled motive power, and electricity affords, through electromagnets and relays, split-second timing of operation sequence. Loom vibration is eliminated by a semi-rotary means of beating up the filling. Operating with a 1/6-hp. compressor, the loom will cost less than conventional equipment.—TEXTILE WORLD

HELIUM FINDS LEAKS

Exact location of leaks in a vacuum system can be found by spraying helium gas over all, or any part, of the system and determining its presence inside with a mass spectrometer. Helium is used because it does not react harmfully with parts of the system.—ELECTRONICS

ALL-WELDED HOPPER

Continuing its development work with Cor-Ten alloy steel (which has saved about 2½ tons per railroad car) Carnegie-Illinois Steel Corp. has had a hopper car designed and welded to order. The car weighs 33,500 lb. empty, 6,540 lb. less than the A.R.A. standard carbon-steel car and 1,500 lb. less than a riveted Cor-Ten car. The weight saving is translated into increased cubic capacity.

Basic design is similar to the hopper standard, but use of welding and alloys allows reduced section thicknesses and elimination of space-taking and trouble-making interior braces. Clear length inside is increased 14 in., width is reduced 6½ in. (to allow for exterior stakes), height increased 4 in., to boost capacity to 2,273 cu. ft., as compared with the standard 2,145 cu. ft.

The car has a welded tubular center sill, ending at face ends of the draft-gear backstops. Face plates are welded to sill ends; draft sills are welded to the center sill. This permits a one-door opening across the car. Sides and other elements are made as subassemblies, later welded together. —WELDING ENGINEER

EASY PLANNING—For devising plant layouts, scale drawings of the equipment are photographed and reproduced as negatives on magnet-cored plastic templets which are easily rearranged on floor plan models backed by metal plates. All details and needs of equipment are visible; and when a satisfactory layout is achieved, the plan serves as a negative to make photographic copies. —FACTORY

SELLING SAFETY

A guided conference method of supervisor instruction in accident prevention resulted in a 67% reduction in Naval Yard injuries. Despite increased and inexperienced personnel, rush jobs, night shifts, and the drafting of key men, the program of 5 hourly sessions trained the supervisors to analyze the inflexible sequence of events causing accidents, to develop and apply best corrective procedures. —FACTORY

Technical Progress in Food

Improvements in processing, plant sanitation, and rodent-control methods reported at annual meeting of food technologists

Thermoduric microorganisms in tomato juice can be destroyed, without harming the flavor or color of the canned product, by preheating the juice at 250°-270° F., filling and closing the cans at about 200° F., and holding the sealed cans inverted for about 1 min. before cooling. Cans sealed at lower than 190° F. should be given a hot-water treatment before cooling.

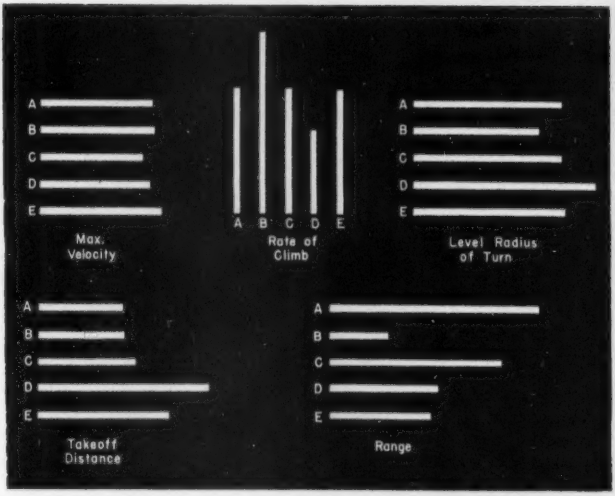
Microanalysis is important in the detection of unsanitary conditions. Of 1,500 rodent-control agents, 3 were found very good, 6 promising. The nerve-poison rodenticide "1080" is rapidly and highly toxic. Rat bait should be a fine mash or liquid. Red squill can be used safely by the public but needs correct techniques to insure satisfaction. Periodic cleaning of equipment should be done during the daily lag-phase of bacteria, to avoid transferring them, and the lag-phase can be doubled by cooling. Free water often will hasten the period of rapid bacterial growth.

Waste disposal may be accomplished by a central plant, such as an alfalfa dryer for fruit and vegetable waste, or by the lagoon method in which liquid waste is dosed with nitrate. Sanitation engineers recommend a 1-story plant with hard-surfaced floor sloped $\frac{3}{8}$ in. per ft., adequate floor drains and glazed-tile walls.

In the manufacture of powdered milk, selective processing will give a good product from a reasonably good fluid milk; copper contamination must be avoided; flash preheating at 230°-240° F. is the trend; keeping quality is not improved by mechanical clarification; moisture content of more than 2.5% accelerates stale flavor; dried in nitrogen or carbon dioxide, milk powder is good after 18 months; prompt cooling is desirable; flavor deterioration is retarded when oxygen content of package is not more than 0.01 cc. per gm.; antioxidants aid in prolonging life of air-packed powder, have no value in gas-packed.

Direct-contact atomized-steam pasteurization distils out undesirable odors and flavors in making butter. In this process, temperatures of the pasteurizing steam vary: 200° F. for butter or ice cream mix, 165°-175° F. for cheese. Time of treatment for the entire flow cycle is 8-12 sec., of which 1-2 sec. is at 200° F. This method (also good for making condensed milk) prolongs storage life and

PROPELLER STEERS SHIP—This cycloidal propeller, with orbit diameter of 7 ft. and 6 vertical blades, each revolving on its own axis, was developed for the Navy LSM. The new design will turn the LSM on its own center or drive it forward as required. —AMERICAN MACHINIST



PLANE POWER COMPARED — Advantages of short takeoff distance and long range, together with a satisfactory rate of climb and level radius of turn, are indicated by comparing computed performance characteristics of 5 hypothetical planes: (A) Composite - engine aircraft using a turbojet engine to assist piston engine in takeoff, climb, and high speeds, or when the one engine fails; (B) and (C), piston engines; (D) and (E), jet propelled. Planes (B) and (D) were designed to have the same sea-level speed as A; planes (C) and (E) the same rate of climb as (A). All planes are comparable in drag, wing area, span, gross weight. —AVIATION

improves body and texture of butter, speeds ripening of blue-veined and non-blue-mold types of cheese.

Predehydration treatments are changing. Prunes are now washed in cold water, grapes are dipped in lye solutions, clingstone peaches are being peeled, all cut fruits except apples and persimmons are being blanched. Sulphuring of blanched fruits after predrying at 180° F. for about 40 min. shows advantages over sulphuring immediately after blanching. Orange juice, concentrated to 63% total solids, is exposed to infrared lamps in a vacuum of 1.2 mm. mercury, on a steel belt inside a horizontal tank. No ice crystals form, and the moisture content of the powder is reduced to less than 2% at a continuous rate of 3 lb. per hr. The powdered juice is removed by a scraper and packaged under vacuum.

In freezing foods, sanitation must be more exact. The flavor of spices in frozen foods becomes more intense with storage; onion and salt become less intense.

Degradation by 10-min. enzymic action of the pectin content of fruit and vegetable juices permits dehydration to 2% moisture without caramelization, or destruction of color or flavor. The resulting products are suitable for molding into confection, or may be reconstituted for use as a base for beverage or flavoring material. —FOOD INDUSTRIES

FOR MORE DURABLE CEMENT

Research on concrete highway bridges in the western states lead to the belief that the finer cement being used in the more recent structures is the cause of their rapid deterioration. According to a recent theory, the maximum limit of 2% sulphur trioxide, while satisfactory for the coarser ground product, is not high enough for the more active, finer ground modern cements, particularly those high in tricalcium aluminate. Investigations indicate that cements of high and moderately high tricalcium aluminate are improved in strain and drying shrinkage by adding higher percentages of gypsum. Drying shrinkage may be influenced by the alkali content independently of calcium aluminate. —ENGRG. NEWS-RECORD

TECHNICAL SHORTS

Nylon Weather—Air-conditioning installed at Hudson Hosiery Mills produced better quality and machine performance of nylon. Standard conditions: throwing (when completed) 68% r.h., 80° F.; sizing, coning, knitting, looping, seaming, and inspecting, 55% r.h., 80° F. —TEXTILE WORLD

Chrome-plated Piston Rings—A significant step toward the solution of excessive piston-ring and cylinder wear is the application of porous chromium by American-Hammered. Best results are obtained with a porous-chromium ring in the top groove, cast iron rings in others. —BUS TRANSPORTATION

Electrostatic Bacteria Catcher—A 1/50-hp.-motor-driven blower draws bacteria-laden air into an electrostatic field where the germs are deposited on agar plates in the new 12-lb. bacterial air sampler developed by General Electric Co. —BUSINESS WEEK

Supersonic Bearing Test—German engineers passed a supersonic sound beam, generated by a 10-mc. oscillator, through aircraft bearings radially. Sudden drop in the meter reading as the bearing was rotated signified an air bubble under lining. —AVIATION NEWS

New Alloy for Jewelers—Jewelers and dentists can make good use of a new alloy of germanium and gold, with 12% beryllium, which is harder and better-wearing, has a lower melting point and better casting properties, than the alloys commonly used in these fields. —SCIENCE ILLUSTRATED

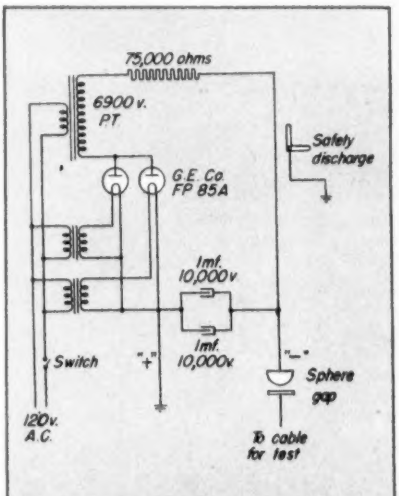
Self-closing Oil Cap—A molded, synthetic (Buna "N") rubber cap with a self-closing slit in the top fits over the end of an oil tube to permit one-hand insertion of the oil-can spout. It is a development by Eynon-Dakin Co. —ELECTRICAL CONTRACTING

Three-dimensional Inspection—Vectographs, or 3-dimensional pictures, aid in classifying, evaluating, and naming textile defects, thus coordinating inspection and clarifying discussion. Polarized light is used in taking and viewing. —TEXTILE WORLD

Stretchable Gauze—Southern Regional Research Lab. has made gauze semielastic by immersion in a sodium hydroxide solution to shrink it. When stretched, it tends to resume its shrunken size. —BUSINESS WEEK

Safety Through Color—Contrasting colors high-light danger areas in substations of Portland General Electric Co. as part of a scientifically planned dynamic painting project. Machinery bodies are dark green; projecting parts, beige; step plates, orange; overhead cranes, yellow; hand rails, conductors, controllers, and switching equipment, black. The ceilings are white or light blue; upper walls, light green; lower walls, dark green. —ELECTRICAL WORLD

Thaws RR Switches—Freezing of railway track switches is prevented in the Cleveland Transit System by 2,000-watt electrical heating elements encased in wrought iron pipes and placed alongside. —BUSINESS WEEK



CABLE FAULTS BY SOUND—United Illuminating Co. has constructed a fault locator for aerial cables which charges 2 mf. of capacitors to about 10,000 volts and then discharges them through a sphere gap to the cable and through the fault to ground. The loud crack of the discharge at the fault can be heard for a considerable distance under quiet conditions. Applied to underground cables, the discharge produces a thump that can be heard 2 manholes away, which necessitates entering several manholes to find the fault. —ELECTRICAL WORLD

Immersion Freezing—Fruits and vegetables, the latter packed in moisture-proof paper cartons, were quick frozen by immersion in liquid nitrous oxide at —90° C. in a pilot plant in Germany. No harmful effects were observed. In the plant, capable of handling 1 ton of food per hr., the refrigerant was recovered. —FOOD INDUSTRIES

Antidote for Alcohol—By injecting sodium lactate into the veins and giving long drinks of sodium bicarbonate, Navy doctors saved the lives and eyesight of 26 men poisoned by wood alcohol. —SCIENCE ILLUSTRATED

Simple Static Discharger—Several U. S. airlines are equipping planes with static dischargers consisting of a wick impregnated with a silver compound for electrical conduction. About 1½ in. is exposed, the remainder being inside a plastic tube. A dozen are used on wing and tail. —AVIATION NEWS

Portable Part-time Heat—Eight 250-watt infrared lamps on a 3-ft. square wood frame suspended from the ceiling keep a worker warm while temporarily in a cold building, such as a milkhouse or workshop. Built for $20 to $30, the heater can be moved easily as needed. —ELECTRICAL WORLD

Low-cost Runway Lighting—CAA tests indicate that airport runways can be inexpensively lighted by placing Scotchlite reflectors at 100-ft. intervals along both sides of the runway and illuminating them with one floodlight for each side. With no glare, pilots see the runway surface easily. —AVIATION

Airplanes to Find Fish—Pacific Coast fisheries will use own airplanes to scout the seas and radio location of tuna schools to boats. Supersonic bottom scanners on planes will sound out good fishing grounds along underwater mountain sides. —BUSINESS WEEK

1,000 Foot Candles—Light intensities as high as 1,000 foot-candles are applied to critical operations, such as the drilling of metal, by a portable 150- or 300-watt spot or floodlight placed at the machine. —ELECTRICAL WORLD

Nailable Steel—The uniformity, strength, durability, and fire-resistance of steel are made applicable to the light building field by framing sections with curved grooves into which regular nails are driven, and holes into which screws are turned. Thus carpentry methods are used. —CONSTRUCTION METHODS

Keeps Pipes Clean—To prevent corrosion, scale, and "red water" in household plumbing systems, a feeder developed by Calgon, Inc., is mounted on the inlet water pipe and filled with Micromet, a chemical which dissolves at 25% a month to give a concentration of a few ppm. —MILL SUPPLIES

NEWSPAPER BY RADIO—Facsimile equipment which produces four 9x12-in. written, printed, or illustrated pages in the home during a 15-min. broadcast has been demonstrated by Radio Inventions, Inc., and will be built by G.E. The recorder attaches to an FM receiver, and a black and white copy emerges from a slot in the top at a rate of 28 sq. in. a minute. —ELECTRICAL WORLD

Dyed Aluminum—Color is imparted to aluminum by first treating it in a special electrochemical bath, then dipping it into dye. The process, developed by Aluminum Co. of America, increases the decorative uses of aluminum. —METAL & MINERAL MKTS.

Pneumatic Guides Improve Skips—12 rubber-tired wheels on each skip assembly at Kirkland Lake have produced smooth, noise-free skip travel, reduced repairs to a minimum, and left the shaft guides clean. A threaded eccentric axle extension permits a 5/16-in. adjustment. —ENGRG. & MINING JOURNAL

Twin Bus Engines—Two Chevrolet engines with a combined 186 hp. drive the new 37-DC "Flxible" streamlined 37-passenger "parlor car" bus. The engines have separate clutches and are geared to a center driveshaft to eliminate synchronizing problems. Either can be operated and either removed for replacement. —BUS TRANSPORTATION

WHAT ARMY LEARNED ABOUT AIRFIELD PAVING

In paving 90 million sq. yd. of airfields in 7 southeastern states, U. S. Army Engineers found that if either of the two essentials (compaction and pavement thickness) was to be sacrificed in favor of the other, a slight reduction in thickness was better than lowering requirements for compaction. To obtain a high density of subgrade—as a base for flexible pavements—limerocks, pebble soils, clay gravels, sand-clay, commercial slags, decomposed reef, and clam shells all were used successfully, the compaction being done in layer construction to a density of at least 95% of AASHO. For asphaltic wearing surfaces, best results were obtained with asphaltic cement having a penetration of 100 to 120, a rich mix of reasonably high stability, surfaces of low abrasiveness, and tight sealing. For bituminous surfaces, asphaltic concrete and sand-asphalt were used. —ENGRG. NEWS-RECORD

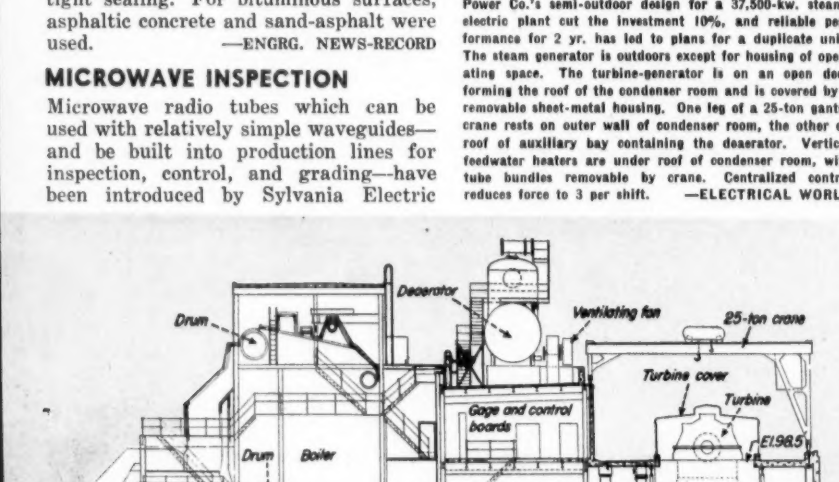
MICROWAVE INSPECTION

Microwave radio tubes which can be used with relatively simple waveguides—and be built into production lines for inspection, control, and grading—have been introduced by Sylvania Electric Products, Inc. Possible applications include detection of faults of structure, moisture content, impurities, surface hardness of metals, and ripeness of fruits. Electrical changes produced as products pass through the system can be amplified and used to operate recorders or relays. —BUSINESS WEEK

NYLON ON COTTON MACHINES

Dress goods are being manufactured from spun nylon-rayon blends on cotton-system machinery. Weave construction is 80 warp and 96 filling ends per inch, and novel effects are obtained by cross-dyeing the fabrics. Picker-beater speeds are 40 to 60% slower, drawing rolls must have a firm bit, lickerin should operate at 290 rpm., size formula is potato starch and beeswax. Humidity and temperature present few problems.—TEXTILE WORLD

LOW-COST POWER HOUSING—Houston Lighting & Power Co.'s semi-outdoor design for a 37,500-kw. steam-electric plant cut the investment 10%, and reliable performance for 2 yr. has led to plans for a duplicate unit. The steam generator is outdoors except for housing of operating space. The turbine-generator is on an open deck forming the roof of the condenser room and is covered by a removable sheet-metal housing. One leg of a 25-ton gantry crane rests on outer wall of condenser room, the other on roof of auxiliary bay containing the deaerator. Vertical feedwater heaters are under roof of condenser room, with tube bundles removable by crane. Centralized control reduces force to 3 per shift. —ELECTRICAL WORLD



Ways to Faster Mining

Application of fundamental principles in installation of cost-cutting equipment and its more efficient use can increase productivity, raise quality, and promote safety

A survey of "Coal-for-Victory" mines shows that new methods and better planning raised the tons per man-shift in deep mines from 5.6 in 1943 to 6.7 in 1945, with a similar increase of 15.1 to 18.8 in strip mines. The improvements include:

Personnel—Training courses in job instruction, job methods, and job relations were made available to supervisors, and formal training for other employees is growing. Company papers build a community of interests, and recognition of achievement supplies incentive. Wide enlistment of employee cooperation in safety measures cuts accident costs.

Planning—Revisions in layout have shortened underground man-travel distance, concentrated on higher tonnage from a smaller area, and tended to the adoption of retreat operation. Two mines use "key-room" plans whereby 6 rooms on each side are started parallel to a 3-panel-heading entry and are driven along with the entries. After the panel is opened, it is converted into rooms that are continued to the limit of the section. The stepped face was adopted by a number of conveyor operators to prevent complete interruption of loading at the end of the cycle and also to increase place width. Advance and retreat in a room is the practice at another mine using chain units.

Loading and Haulage—Many mines have bought higher-capacity track-cutters or shortwalls, usually with 8- to 9-ft. bars. In transportation, most cars are more than 5-ton capacity, several more than 10-ton. Rubber-tired haulage is widely used, and chain and belt conveyors frequently are employed behind loaders. Mines using crawler loading machines had outputs of over 12 tons per man in seams 54 to 74 in. thick. At one mine, shooting and loading the top slate with the coal, and substituting a hoist for a locomotive in spotting trips for loading, permitted crew reduction from 16 to 12 with no decline in tonnage. Along with the operation of 8 and 10 self-loading conveyors per mother belt, one mine in 62-in. coal changed panel entries from 932 to 1,500 ft., number of rooms from 18 to 30 and raised tons per man-shift from 5.45 in 1943 to 6.21 in 1945.

Six-ton instead of 2-ton cars were in large part responsible for increasing tons per man from 8.5 in 1943 to 11.0 in 1945 at a mine in 96-in. coal. Efficiency in general was raised by reducing changing distance, by using rubber-tired haulage and more mother-belt conveyors.

Face Preparation—In cutting and drilling, heavier, higher capacity units were increasingly employed, with a trend from handheld to post or mounted. Several mines used the new alloy-insert tip for cutter and drill bits, with substantial increase in places cut per set. Close study of conditions prior to drilling resulted in powder saving. Better supervision and attention to the drilling problem was responsible for increasing monthly footage with a horizontal machine (one shift a day) from 7,500 to 8,500 ft. Redesign of equipment produced an increase of 35% in footage.

Transportation—Much of the credit for increased production goes to the improvements made in transportation, such as: anti-friction bearings, automatic couplers, bigger locomotives, tandem or double-header operation, heavier rails, grade reduction and cutoffs, better drainage and roadbeds, improved car-feeding equipment for slope chains and cages.

Power—Most mines increased voltage, put transformer stations close to load

centers, used central metering with individual metering of branch lines and loads, and installed capacitors to obtain a power-factor of 98% or better. At a hand-loaded conveyor operation, face voltage was raised from 200 to 230 by double-bonding rails and adding feeders and a 4/0 return, this improvement increasing tons per man-shift (36-in. coal) from 5.0 to 6.15.

Ventilation and Drainage—Modern fans, ample airways, leakage reduction, one-way travel, and splitting and overcasting are the ways to more efficient, low-cost, safe ventilation. Clean straight airways, plus slants and long curves, reduce friction and turbulence. To increase production by 10% in one mine by drying up working places, two 5x5-ft. drain entries eliminated twenty 10-hp. pumps. Another mine eliminated 7,000 gpm. of pumps by carrying water from gathering pumps in a 5,000-ft. ditch to the main sump. Automatic controls and shortening of pumping distance were other ways for low-cost dewatering of mines.

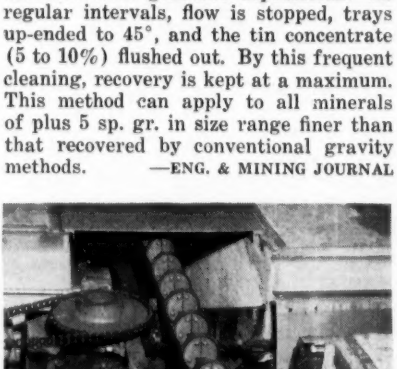
Maintenance—By frequent inspection and good records, by training maintenance men and having good shop facilities, the "Coal for Victory" mines reduced delays and costs. Using 2 grades of good lubricating oil, instead of 8 or 10, reduced handling labor 50%. Installing corrosion-, abrasion-, flame-, and heat-resisting materials increased efficiency. —COAL AGE

1,500-FT. BRIDGE WELDED

A welded, continuous-girder bridge 1,500 ft. long, recently completed in Canada, has expansion joints only at the ends, and the concrete deck serves as a lateral bracing. A deep concrete facia masks the ends of the floorbeams. Stiffeners, used on inside of girders only, serve also as floorbeam seats. To eliminate locked-up stresses (with consequent buckling) in the girder field splices, the flanges were butt-welded, then 12 in. of the web from both top and bottom was welded, then the flange-plates were welded on, and finally the web joint completed. —ENGRG. NEWS-RECORD

TIN FROM TAILINGS

To recover tin occurring as 0.1% of mill tailings at Kimberly, B. C., the tailings flow across concentrator units of tilted trays containing rubber-coated matting indented with grid-like depressions. At regular intervals, flow is stopped, trays up-ended to 45°, and the tin concentrate (5 to 10%) flushed out. By this frequent cleaning, recovery is kept at a maximum. This method can apply to all minerals of plus 5 sp. gr. in size range finer than that recovered by conventional gravity methods. —ENG. & MINING JOURNAL



CONVEYS METAL CUTTINGS—In Packard's Detroit plant, automatic under-floor conveyors speed movement of chips from 181 machines to the baling room. Chips fall through grates into 11 cross-conveyor troughs through which abrasive-resistant upright disks of synthetic rubber move on a chain. From the troughs, the chips discharge into hoppers and then into a main disk-in-tube conveyor (foreground). —BUSINESS WEEK

SHADOWLESS LIGHTING

By adopting a grid pattern—parallel runs of fluorescent fixtures 7 ft. apart and similar runs 10 ft. apart at right angles to the first—a Chicago plant solved the problem of shadows on intricate machines and eliminated light rearranging to meet changing plant layouts. The new system consumes no more power than the former incandescent one. —FACTORY

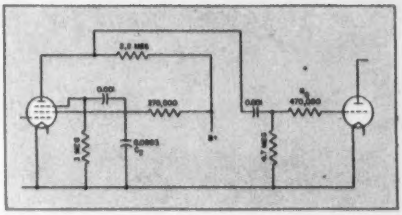
FEATHER-WEIGHT ROOF

In reroofing the dome and 2 barrel arches of Cincinnati's Union Terminal, 32,000 sq. ft. of sheet aluminum was used, as well as 11,500 lin. ft. of extruded aluminum batten and cap, and the new roof weighs about 1/20th as much as the old nonmetallic roof. The sheets are 14-gage for curved surfaces, ¼-in. for flat. To anchor the sections, holes were drilled through the underneath layers (15-lb. asbestos felt, 30-lb. felt, 1-in. cork, 30-lb. felt) into the concrete to receive expansion shields. Slots in the battens allowed for expansion or contraction. —ENGRG. NEWS-RECORD

CAPACITORS CUT COSTS

By installing shunt capacitors in the plant circuits of mines, mills and smelters, losses are reduced, system capacity is released, and voltage regulation improved. The capacitors supply the magnetizing current for motors and transformers, thus eliminating handling of this extra current over the power-supply system and reducing the generator and distribution capacity necessary for handling the load.

One company reduced its monthly power bill by $453 by installing a 570-kva. capacitor. If capacitors are installed to improve the power factor of an 8-motor circuit from 76% to 95%, 2 additional motors can be added with no increase in line current. If the p-f is 75%, a 20% gain in kw. can be made by adding 2.38 kilovars of capacitors per kw. gaind. —ENG. & MINING JOURNAL



SUPER A-F AMPLIFIER—Voltage gains of 300 to 500 (instead of the usual 40 to 50) and a safe minimum gain of 250 are attained in a single pentode tube of special design operating from a 45-volt plate supply. The pentode operates as two triodes in cascade. Grid 2 serves as the anode for the first triode, while grid 3 and the plate form a second triode system. A complete circuit diagram of the amplifier, feeding into a third triode stage (at right) is shown. —ELECTRONICS

SHARING THE PROFITS

To increase the worker's interest in making the operation profitable, Cincinnati and Lake Erie Transportation Co. is sharing the profits. At the end of each fiscal year, 15% of net income is put into a trust fund. During the following year, each hourly rated worker receives an additional 10¢ a straight-hour from the fund. Salaried employees get a percentage of their monthly pay equal to the average percentage received by the hourly paid workers. If the net income drops, the profit sharing is reduced proportionately. —BUS TRANSPORTATION

HOT SPINNING

To speed up and expand the range of the metal-spinning process, raw stock is now heated with oxy-acetylene flames before spinning. The process has been used in spinning heavy tubular parts such as gas cylinders, shock-absorber housings, and hand grenades.—WELDING ENGINEER

AIRLINE EXPANSION

By 1948, when U. S. domestic airlines will have received all the new transports now being ordered, they will have a seat-miles capacity of more than 3 times the 9 billion passenger miles of railroad pullman travel in 1941.—AVIATION NEWS

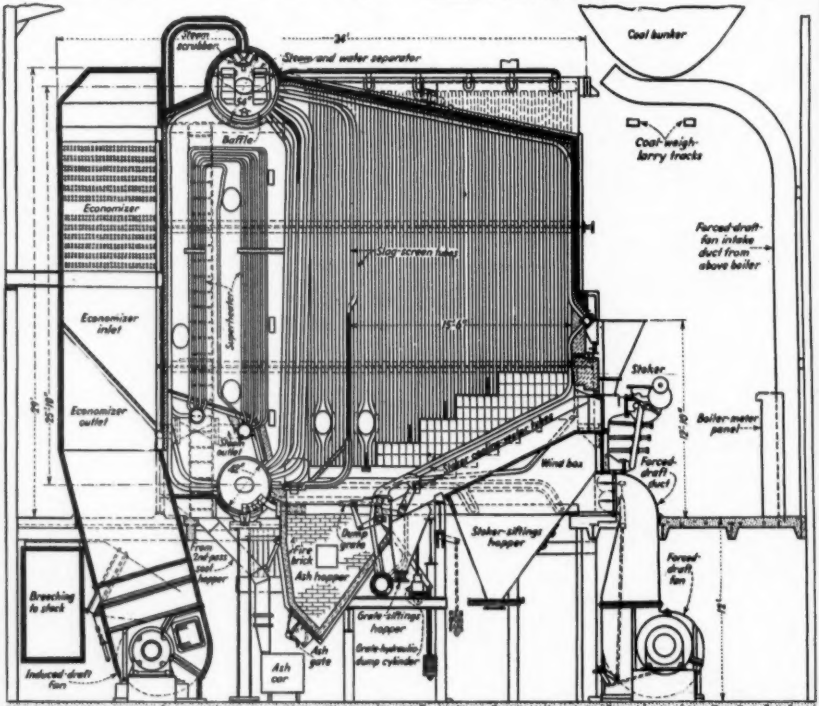
New Boiler Saves 20%

Postwar change increases efficiency of Canadian steam plant, utilizes stoker firing, with combustion rate of 10,400 lb. of coal per hr.

Some indication of the improvement in boiler and auxiliary design in recent years is given by the 20% reduction in steam costs obtained by E. B. Eddy Co., Ltd., Chaudiere Falls, Que. This paper company supplements a 15,000-hp. hydroplant with steam boilers, having three 8,190-sq. ft. stoker-fired units and two refuse-burning boilers.

During the war, steam demands required operation of the stoker-fired boilers at maximum continuous rating 6 days a week, with coal supplementing refuse under the other two. This resulted in poor overall fuel economy.

A 12,297-sq. ft. integral-furnace boiler has now been installed, designed for 460 psi. but operating at 175 psi. and 130° F. superheat like the older boilers. This provides for future high-pressure needs and added little to cost, as the boiler cost only 5% more than a medium-pressure



This boiler has the maximum capacity that could be installed in the available space.

unit. This is true because only drums, headers, and tubes need be built initially for high-pressure operation. The boiler has a continuous rating of 100,000 lb. of steam per hr., and is a 2-drum design with 12,297 sq. ft. of boiler and water-wall heating surface, plus 3,720 sq. ft. in an economizer. Furnace walls are bare with stud tubes except along the stoker fuel bed, where Bailey blocks protect against erosion. Two rows of radiant tubes form a slag screen for the boiler and super-heater tubes. Slag-screen tubes are staggered and spaced on wider centers than those directly behind them to cool molten slag without bridging. Slag and cinders fall on the 286-sq. ft. stoker's rear end where combustion is completed before they go to the ash hopper.

Two longitudinal baffles direct gas flow. Gas goes through a boiler-tube bank, superheater, and to the rear wall in the first pass. It goes around a baffle and through the second pass of boiler tubes, is turned by a baffle at the front row of tubes, and flows through the third pass to the horizontal-tube economizer at the rear. Superheater tubes are nearly vertical for self-draining and are in the first pass behind the slag screen and three rows of boiler tubes to avoid slag deposits. Steam separators and scrubbers are built into the boiler drum. No air heater is used because of space limitations.

Combined boiler and furnace efficiency is 86%, and steam costs have been cut 20%. Steam load can be carried on the new boiler and two of the old stoker-fired units, leaving a spare. —POWER

PARKING ECONOMICS

Parking meters, used in 473 cities, resulted in a reduced (by as much as 20 min.) average car parking time, a more rapid (by as much as 9%) movement of traffic, and an average annual income of over $60 per meter. Commercial vehicles are allotted specified hours or zones for loading. —ENGRG. NEWS-RECORD

COLD SPEEDS ASSEMBLY, IMPROVES METALS

Steel valve inserts are shrunk 0.002 in. for installation at a rate of 360 an hr. in passenger automobile engines by chilling to −120° F. in mechanical refrigerators which eject the parts automatically. Metal parts in new car bodies are stronger and more ductile because of "cold" treatment. High-speed drills, hack saws, and other cutting tools have longer life as a result of increasing ductility and hardness of edges by refrigeration.

An aircraft manufacturer doubled production on shrink-fit assemblies of landing struts, and another cut production costs in the shrink-fit assembly of a bushing in a diesel-engine piston by refrigeration. In other applications, a gear spline is shrunk for hand-press assembly to save time and avoid strains, and a cast-iron cylinder liner is shrunk for insertion into an engine. —BUSINESS WEEK

LARGEST CASTING

The 486,000-lb., 27 x 12½ x 8½-ft. base for a 6,000-ton press to forge auto crankshafts is expected to be the world's largest casting. United Engrg. & Foundry will pour it. Patterns will take 3 months, molding and coring 2 months, pouring only 3½ min. (800,000-lb. from 4 open hearths), cooling 1 month and annealing 1 month. The Carnegie-Illinois' 90-ft., 12-wheel, alloy-steel car will take it at 8 mph. to Ajax Machinery, Cleveland, where machine tools will be brought to it instead of the other way around. —AMERICAN MACHINIST

CHEMICAL SPARKPLUG

Liquid ignition in German aircraft engines produced fuel savings up to 5%, enhanced knock-free performance, increased the spark energy 600% over sparkplugs. Sprayed into the cylinder, diethyl-diglycol-ether ignites by compression heat, attains fast, complete combustion, saves weight, sets up no radio interference. —AVIATION NEWS

NEW PRODUCTS

Typewriter for Blind—A tiny 18-oz., 6-key Braille typewriter records words and numbers on paper tape, will put several hours of note-taking on a single roll. International Business Machines will mass-produce it within a short time. —BUSINESS WEEK

Streambarker—Allis-Chalmers has developed the "Streambarker", a machine for removing bark from logs. A chain conveyor carries logs between twin sets of bed rolls, the first fluted, the other spirally threaded, with a wire brush between. Speeds vary, so projections on rolls lay open the bark, which is torn off by 650-lb. water jets supplied from a 4-stage, 600-gpm. pump driven by a 350-hp. motor. —PRODUCT ENGINEERING

Broken-bottle Leakproofer—If bottles of chemicals are broken, their corrosive contents will not leak when they are dip-coated with 0.02 in. of a tough nitrocellulose plastic developed by Detroit Macoid Corp. The plastic can be colored. —BUSINESS WEEK

Plastic Glows in Dark—Lucite sheets containing a pigment which fluoresces under ultraviolet, or that is phosphorescent after exposure to ordinary light, have been developed by du Pont. —ELECTRICAL WORLD

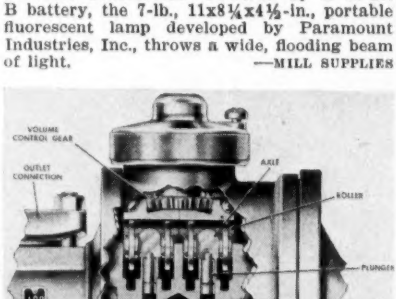
Connectors Grow Up—The coiled connectors which once prevented sagging and catching of electric-iron extension cords are now made in larger sizes by Kellogg Switchboard for use on machine-tool heads. Neoprene insulation is used. —AMERICAN MACHINIST

Potent, Safe Peroxide—A new, stable, organic-soluble hydrogen peroxide, available in concentrations up to 90%, has possibilities for use in commercial explosives and synthetic chemicals, as well as buzz-bombs, rockets, and submarines. Of high purity, this product of Buffalo Electro-Chemical Co. will not detonate by shock, and when released leaves no residues or corrosive toxic gases. One volume equals 413 volumes of oxygen gas. —CHEM. & MET. ENGRG.

Unbalance Detector—Westinghouse has developed the Microbalancer, an electronic device so sensitive it can detect the unbalance in a rotating part from the presence of a wisp of lint. The tool sped production of the variable-time proximity fuse and of the gyro rotors. —PRODUCT ENGINEERING

Little Chevrolet—Welded tubular chassis, helical springs set in wells, independent axles for each wheel for "knee action," and 1,000 lb. less weight than regulation are expected to feature the proposed low-priced Chevrolet. Wheelbases will be about the same as the regular model, but the engine will be lower powered. —AMERICAN MACHINIST

Portable Fluorescent—Powered by a 30-hr. B battery, the 7-lb., 11x8¼x4½-in., portable fluorescent lamp developed by Paramount Industries, Inc., throws a wide, flooding beam of light. —MILL SUPPLIES



COMPACT PRESSURE—Capable of developing 5,000 psi. and 40 hp., the Superdraulic pump is only 9 in. in dia., yet can deliver 0 to 17 gpm. at 1,200 rpm. It is a radial plunger unit arranged so centrifugal force maintains plunger rollers in contact with an elliptical reaction ring. Each plunger makes two strokes per revolution. In variable-delivery units, two banks of 11 plungers each are arranged in parallel in a single rotor, each with its own reaction ring. Rings are geared to rotate in opposite directions in response to the volume-control gear. At full delivery, major axes of the rings are parallel; at zero delivery they are at right angles. —AMERICAN MACHINIST

Nylon Fuel Tank—The specially treated nylon fuel cell for the Boeing "Stratocruiser" holds 203 gal. but can be put into a 6-in. mailing tube. Extremely tough, the flexible tanks save 1,500 lb. in the 67½-ton plane. Glove-type fasteners and a 2-ply glass fabric liner hold the tank in place. —AVIATION NEWS

Rubber Rivet—For sealing small breaks and nail holes in tires, a new "rivet" of J. W. Speaker Corp. consists of a circular rubber base and a rubber stem with spiraled steel needle. The stem is lubricated with rubber cement, the needle is pushed through the hole from the inside, then pulled off. The stem shortens and spreads against the walls of the hole in sevice. —CONSTRUCTION METHODS

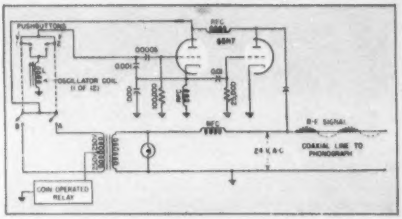
6-in-1 Electric Meter—The Multi-Ranger designed by Marion Electrical Instrument Co. can be used as a voltmeter, milliammeter, high- and low-resistance ohmmeter, a.c. voltmeter, decibel meter. —ELECTRICAL WORLD

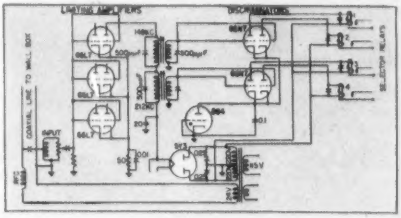
For Truck Driver Comfort—In a new system of heating and ventilating truck cabs, fresh air is pulled through a weatherproof opening in the cab side panel, heated by a hot-water radiator, and forced by a fan into a plenum chamber formed by sealing off the space behind the instrument panel. Adjustable openings in the chamber direct the air up over the windshield for defrosting or forward into the cab, as desired. A thermostat controls temperature with this Evans Products Co. heater-ventilator. —BUS TRANSPORTATION

Four-piece Nut—Put together with dovetailed interlocking joints, the hexagonal nut invented by M. J. Shaffrey can be assembled on short threaded sections of a shaft, is easily removed from corroded threads. The inventor also has a threaded cutting die of the same construction. —BUSINESS WEEK

Simple Flow Meter—For indicating rate of flow of liquids or gases through lines containing orifices, venturi tubes, or flow nozzles, a gage introduced by Builders-Providence, Inc., has no stuffing box. The mechanism is inclosed in a glass-windowed chamber filled with transparent fluid which transmits pressure from the low pressure line to the outside of a metal bellows. Pressure from the high-pressure line is communicated to the inside of the bellows, the gage operating on the differential. —CHEM. & MET. ENGRG.

Tough Plastic in Colors—Washing machine agitators, appliance housings, and refrigerator trays may be made in a range of standard colors from the new plastic, Melmac 3020, of American Cyanamid Co. It is a rag-filled melamine formaldehyde, the first thermosetting, shock-resisting plastic made available in colors. —ELECTRICAL WORLD





REMOTE RECORD SELECTOR—Rapid, independent, and non-interacting remote selection of records in an automatic phonograph is provided by Aireon Mfg. Corp.'s carrier current system. Button 1 in wall-box circuit (above) selects oscillator coil L and winding B of the high-voltage secondary of the step-up transformer. Button 2 selects the same oscillator coil, but winding A. When a button is pressed, pulses lasting from 0.1 to 0.25 sec., depending on the constants of the button and the coin-operated relay, are transmitted over coaxial cable to the receiver in the phonograph cabinet (below). The r-f is coupled to the grids of only one 6SN7 because of the frequency discrimination of the filters. Selection of the discriminator-tube plate depends on the phase of the voltage at the wall box, odd-numbered buttons being of one phase, even-numbered of the opposite phase. The discriminator tubes operate the record selector relays. Twelve carrier frequencies (12 coils) and use of both alternations of the power line permit selection of 24 records from any wall box. Using 24 volts to the wall boxes and less than 1 volt r-f, the cables need not be in conduits. Installation and maintenance costs are lower, interference between boxes less, than with other remote selection systems. —ELECTRONICS

Selenium Replaces Tube—A midget, 5-plate, square-stack selenium rectifier has been designed by Federal Telephone & Radio Corp. to replace the rectifier tube in portable radio receivers. It lasts much longer, requires no warm-up. —ELECTRONICS

Electric Lawn Mower—Rolling freely on 3 rubber-tired wheels, the new mower of Monitor Equipment Corp. has a 1/3-hp., 1,725-rpm. electric motor which revolves the blades fast enough to chop the grass into a fine mulch that eliminates raking. It has a power take-off. —ELECTRICAL MERCHANDISING

NEW PRODUCTS

Electronic Beverage Inspector—Minute particles of foreign matter, even when transparent, are detected in carbonated beverages at production-line speed (140 a min.), and defective bottles automatically rejected, by a machine developed by Radio Corp. of America and Coca-Cola Co. Light beamed through the filled bottles actuates the photoelectrically controlled rejector. —BUSINESS WEEK

Tank Empty, Valve Closes—An automatic valve, designed to close the gathering line connected to oil-field lease tanks as soon as liquid has been withdrawn and before vapor can be pumped into the system, consists of a spherical float connected to a balanced double-disk valve. When liquid is available, the level rises in the float chamber, causing the valve to open. Other possible uses of this Davis Regulator Co. valve: draining condensate from multiple-effect evaporators, gas-liquid accumulating tanks, and condensate flash tanks. —CHEM. & MET. ENGRG.

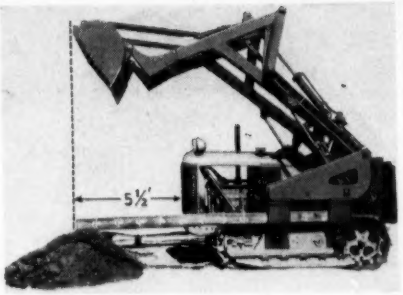
Air-rubber Shock Absorber—A package-unit undercarriage utilizing a rubber cylinder filled with compressed air as a shock absorber has been introduced by Firestone Aircraft Co. for planes lighter than 3,000 lb. Friction rings restrict bouncing. —AVIATION NEWS

Permanent Beam Jack—After raising sagging floor beams, the screw jack devised by Perma Jack Corp. remains as a fixed support. It is a 41-lb., 8-ton-capacity, telescoping tubular steel jack-and-post, with holes and pins permitting adjustment between 4 ft. 10 in. and 8 ft. 10 in. —BUSINESS WEEK

Tunable Magnetron—A new type of tunable magnetron tube for pulsed transmission within the 6- to 7-cm. range and for frequency modulation where deviations up to 500 kc. are desired has been introduced by Sylvania Electric Products. —ELECTRICAL WORLD

Keeps Insects Away—Rated effective for 36 hr. in temperate climates, 10 hr. in the tropics, the Navy-developed Repellent 448 is being produced commercially by Chanceler Chemical Corp. Colorless and nearly odorless, "d'Ter" is said to be harmless to fabrics and nontoxic. —BUSINESS WEEK

Self-locking Nut—Slight bends at three points in the last threads of a new lock-nut introduced by Grip Nut Co. prevent the nut from loosening yet permit it to spin freely through most of its travel onto the threads of the end of the bolt. —MILL SUPPLIES



STRONG-ARM LOADER—Drott Manufacturing Corp. has produced a front-end tractor loader with a high lift of 10¾ ft. and a reach of 5 ft. Finger-tip control of the hydraulically operated unit is possible while tractor is at rest or in motion. —COAL AGE

Nails Tags on Steel—A ¼-in. nail, so tough that it is used to tack tags to cold steel ingots, has been developed by American Steel & Wire Co. —BUSINESS WEEK

Powerful Little Air Hammer—Weighing only 27 lb., a new impact air hammer delivers several 4,000-lb. (or lighter) blows a second, the ram automatically returning to the "cocked" position after each blow. Mead Specialties Co. designed it with narrow width to permit multiple punching of holes on 1¾-in. center. —MILL SUPPLIES

Broken-bit Extractor—For removing drill bits, diamond bits, and broken drill rod from rock drill-holes, a magnetic device of Dings Magnetic Separator Co. is made in 1¼- and 1½-in. diam., weighs 1 lb., will lift 25 lb., and has unusual holding ability on small, uneven surfaces. —COAL AGE

Discharge Check Valve—To give positive protection against back surge in discharge lines carrying steam, sludge, or waste liquids in gravity-flow installations, the J. A. Zurn Mfg. Co. has developed a check valve equipped with a swing check flap suspended from a full-floating pin. —CHEM. & MET. ENGRG.

Plug-in Pilot Light—Standard plug-in electric outlets can be equipped with Industrial Devices' new neon light attachment which indicates whether the appliance switch is on or off, if there is switch control, whether plug has been pulled. —ELECTRICAL CONTRACTING

Self-sharpening Knife Rack—Each time a knife is withdrawn from one of the 6 slots in the glass-faced, wooden rack made by Robeson Cutlery Co., its edge is whetted on a built-in sharpener. —BUSINESS WEEK

Foamed Plastic—Lighter than cork, du Pont's new cellular cellulose acetate combines heat insulation with structural strength when bonded by a thermosetting resin between sheets of metal, wood, or plastic. It can be used as a core in airplane structures, refrigerators, luggage, truck bodies and prefabricated houses. —BUS TRANSPORTATION

Hat Defies Rain—Made of wool and water-repellent Vinyon plastic fibers, a new "plastic-felt" hat for men is said to retain its shape through severe rains. —BUSINESS WEEK

Variable-stroke Pump—Varying the position of an eccentric will adjust a triplex pump produced by Worthington Pump & Machinery Corp. to any capacity from 0 to 100%. A hydraulic control cylinder automatically varies the stroke. The pump is suitable for hydraulic extrusion presses and product charging. —CHEM. & MET. ENGRG.

Math Charts—For workmen who lack knowledge of higher mathematics, revolving-dial window-type charts, with accompanying manuals, are being produced by E. H. Needham. Compound and spherical-angle charts, with accurate equations, 6-decimal radian conversion and function tables, and fully calculated problems, show how to do such jobs as calculating unknown solid angles, setting up drilling holes or machining surfaces to compounds. —CONSTRUCTION METHODS

Self-valving Hose—A short end section of hose developed by B. F. Goodrich Co. contains a valve which releases water only when the user bends the hose. —BUSINESS WEEK

Quick Wire Stripper—Insulation is effectively stripped from the contact ends of electrical wires by insertion between two oppositely rotating wire brushing wheels in a unit made by Osborn Mfg. Co. —ELECTRICAL WORLD

All-in-one Ignition—Coil, condenser, and distributor are combined in a plastic case to eliminate internal wiring and external high-tension coil lead in the 2½-lb. Uni-power airplane ignition system of LaPointe-Plascomold Corp. —AVIATION

Flyweight Radio—Designed for personal planes, the new 3,105- or 6,210-kc. radio transmitter of Electronic Specialty Co. weighs but 1 lb. 4 oz. It operates on dry batteries, does not have to be tuned after installation. —AIR TRANSPORT

Three-roll Crusher—In a new crusher of Pioneer Engineering Works, rock is fed into opening between top roll and stationary roll, then passes between stationary and horizontal floating roll. The rolls have manganese steel shells. —CONSTRUCTION METHODS

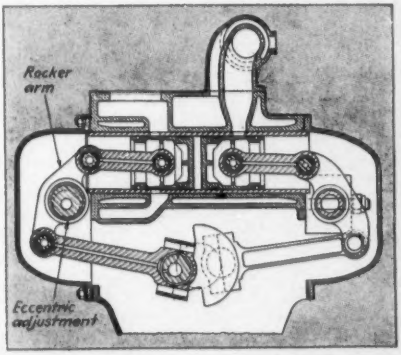
Furnace Flexibility—An unusual system of enriching the gas atmosphere is used in a Surface Combustion muffle furnace and makes it suitable both for gas carburizing and for general heat-treating. Only about 10% of the muffle gas is withdrawn at a time. It is filtered to remove free carbon, enriched by metered gas, then pumped through a venturi at high velocity. It draws muffle gas through the venturi for mixing and recirculating. The shift from carburizing to heat-treating can be made quickly without shutting down the furnace. —AMERICAN MACHINIST

Accurate Hole Spacer—To assure positive accuracy in the spacing of holes in metal parts, an optical center-locater set has been devised by Master Specialty Co. It consists of an adjustable magnifier, a holding fixture, 16 bushings, and a punch. —MILL SUPPLIES

Packaged Air—Compressed air is fed from cylinders to respirator masks in the quantity needed by the wearer, in a new breathing apparatus produced by Scott Aviation Corp. for fighting mine fires. —COAL AGE

Two-Way Clothespin—Since it has slots in both ends (at right angles to each other) a wood clothespin made by Moore & Monroe is always right end up. —BUSINESS WEEK

Floating Alloy—A new alloy of magnesium and lithium, with silver, is fairly strong, yet lighter than water, the Institute of Metals, in London, reports. —SCIENCE ILLUSTRATED



VARIABLE-COMPRESSION—A horizontal 2-cycle, 2-cyl., uniflow engine with opposed pistons in a common cylinder has been developed by H. J. Hickey. Adjustment of an eccentric bearing in the rocker arm connecting the piston rod and crankshaft rod varies piston position and compression ratio to suit the fuel used. Timing gears, valves, and cylinder head are eliminated, ports being substituted for valves. Greyhound is considering the engine for bus air conditioning units. —BUS TRANSPORTATION

What Course Prosperity?

New economic concept needed, one which permits relatively free play of basic factors within a framework that provides security

Many economists do not accept the stagnationist philosophy—that our economy is mature and senile; that the lack of investment opportunity causes savings to lie idle and cause a break in the total demand for goods and services; that continuous government deficit spending is necessary to sustain prosperity. If our world appears mature and overripe, it is because we have not allowed economic progress to flourish.

There is a road to prosperity. It lies in the direction opposite to that now followed. It requires balancing of security with progress; nationally and internationally. The economy must be rid of the institutional and psychological frictions that inhibit investment, and monetary-fiscal policy must be reconstructed to combat "cyclical" fluctuations.

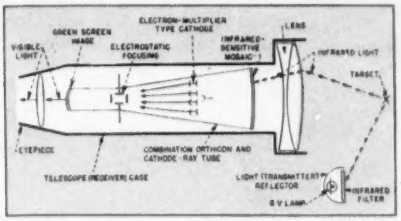
A free society cannot continue to exist without making the individual, morally and ethically, the final unit of accountability for its existence. The Keynesian economists have come to lean too heavily upon the kind of policy that denies the final accountability of the individual and even of economic groups. They place emphasis upon government deficit spending and the redistribution of income as the means to economic stability and full employment, without considering how the best use of our limited resources may still be attained.

The rates of change of prices (costs) cannot be too greatly divergent for most industries, products, resources, and labor. Should some prices be noticeably less flexible than others, there will be divergencies in price expectations and greater or less efforts to increase the turnover of assets. The process of capital formation can be greatly disturbed by the lags in some prices behind others, and these disturbances may, in turn, greatly distort the various flows of money into expenditures or hoards.

It is not denied that stability is also associated with the individual's expenditure of his income. This postulate, however, does not embrace the casualty assigned to these actions by the Keynesians through the liquidity-preference concept. It is the actions of business men that may be assigned significant values as forces initiating the upward or downward cumulative process. Once profit expectations rise and business assets begin to turn faster, raising the income expectations of individuals, the turnover of their assets would lend considerable impetus to the cumulative upward process.

A consistent program also calls for a "new" economics. To give it fundamental guidance, a theoretical framework that relates money income and expenditure flows of "real production and real income" must be developed. It is the economics that will state the balance between security and progress. The economics must set the limits within which government can aid the enterprise system to preserve as high a degree of security as possible, correlative to a progressive economy. It must also show the pattern of a workable monetary-fiscal program.

A workable and effective antimonopoly policy is of paramount importance, but one which attacks restrictive practices in the light of how they prevent economic expansion. Open access to goods, capital, and labor markets must be restored. Free entry is the best antidote to monopoly. Restrictive practices of international cartels should be outlawed. Labor union policies that force wages out of line with the wages that would prevail with free entry of labor into occupations are



NIGHT SIGHT—Heart of the infrared Sniperscope for aiming a rifle at a target in darkness is an orthicon-type television tube. It has a mosaic sensitive in the infrared region between 80,000 and 120,000 Angstroms, a photoelectric cathode of the electron-multiplier type, and an electrostatically focused cathode ray. Light from a 6-volt, 30-watt lamp passes through a near infrared filter, strikes the target, reflects back into the sight lens, forms an image on the mosaic, and this is converted by the tube into a visable image. A vibrator supplies 4,500 volts d.c. to the tube. —ELECTRONICS

antisocial and are a cause of unemployment. The possibility of patent licensing that will maintain the best features of competitive enterprise should be explored. Finally, the price policy intended to aid agriculture requires considerable revision.

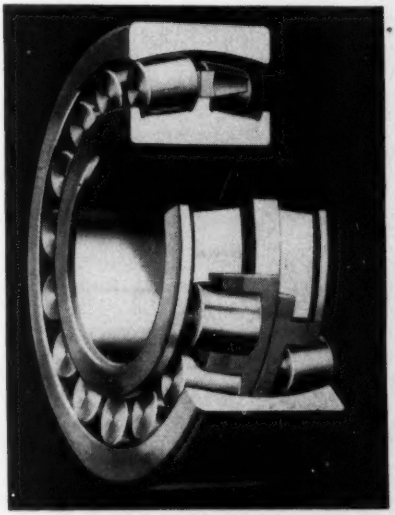
A major contribution to world trade is the writing of a workable peace to provide security from future wars. Those practices that lead to inhibitions of the flow of products among nations should be eliminated. Government taxing and spending, coupled with money manipulation, should be stimulatory and not depressive upon individual initiative and enterprise. Monetary-fiscal policy is not a substitute for a flexible price policy. "Economic Stagnation of Progress", McGraw-Hill Book Co.

PHOSPHATE RUSTPROOFER

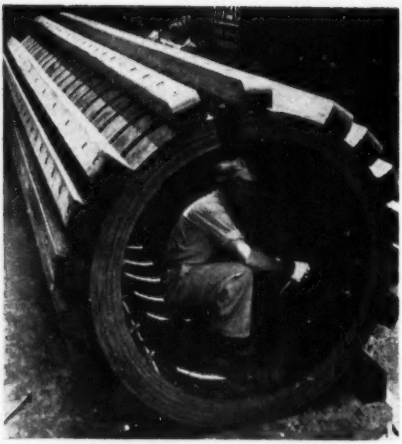
In a new rust proofing process for steel, an insoluble inorganic phosphate coating is applied by spray, immersion, or brush to form an amorphous film that withstands bending or die stamping. Developed by Calgon, Inc., the Banox technique protects the metal between cleaning and painting and is a good base for the finish. —BUSINESS WEEK

RUSSIA BUILDS

The Soviet government, planning large-scale construction, standardizes, finances, and builds all structures, trains all personnel in many types of schools, and sponsors research. A new theory for designing reinforced concrete is based on the ability of structural members to carry load up to failure, and the formula used calls for about 10% less steel. Bending stresses are computed by formulas based on a parabolic stress distribution. In construction arches, thin brick-vaulted roofs are used in seismic regions, and another vaulting uses double curvature and a shape precluding tensile stresses. For winter concreting, one method passes a-c through wet green concrete, the resulting heat being used to accelerate setting and hardening, and prevent freezing. Precut and precast panel types for houses will be widely used, and the sectional type will be employed later. —ENGRG. NEWS-RECORD



TWO-WAY THRUST—A new self-aligning spherical roller bearing, offered by the Torrington Co., features two-directional thrust, high radial and thrust capacity, and unit construction for easy installation. —COAL AGE



SHIP SHOCK ABSORBERS—Used between ships, or between ship and wharf, two new "camels" prevent damage. A type developed by the Navy is constructed of 6 parallel strings of steel box pontoons, with ends timbered to prevent metal-to-metal contact. A new cylindrical camel (above) is a series of split rings of laminated oak. It is light, easily repaired, absorbs longitudinal rack. The 4½-in. gap takes a 250-ton shock. —CONSTRUCTION METHODS

FOUNDRY PROGRESS

Small, intricate casting cores are made at a fraction of the cost of the old hand method by a new Redford Iron & Equipment Co. machine, which is easily operated by women. . . . Cores are dried and baked in as little as 30 sec. by dielectric heating in Induction Heating Corp.'s new machine. A thermosetting resin is used in the sand, instead of oil, in making the core. . . . Foxboro Co. has developed a method of weighing the air which goes into the cupola in order to eliminate variations caused by barometric pressure and other factors. . . . Called a mulboro, a round wheelbarrow devised by Beardsley & Piper Co., fits snugly under a cover enclosing a muller to permit mechanical mixing of the sand. . . . Acme Aluminum Alloy's "Almag 55," consisting of aluminum and magnesium and smaller amounts of other elements, may replace cast and malleable iron for many purposes. . . . A new recovery unit of National Engineering Co. sends the sand through a wet scrubbing process, then to a settling tank to remove the silt, and finally removes the carbon in a furnace. —BUSINESS WEEK

ELECTRONIC SORTERS REJECT BAD BEANS

Electronic sorters have met the test of practical service, and 1,000 of them in the U. S. and Canada are picking the bad out of 700 tons a day of beans, peanuts, coffee, seed corn, and even potatoes.

One bean at a time is fed mechanically through these Electric Sorting Machine Co. units. Light from a lamp is reflected by the bean through the lens to a partial mirror, which reflects half of the light through a red filter to a red-sensitive phototube and transmits half to a second mirror which reflects it through a green filter to a green-sensitive phototube. The outputs of the phototubes are amplified and fed to the deflection plates of a cathode-ray tube to control the horizontal and vertical sweeps of the electron beam. A bad bean throws the beam outside of a partial mask on the cathode-ray tube face to actuate a third phototube that operates a rejector mechanism to throw out the bean. —ELECTRICAL WORLD

PREVENTS FRUIT BROWNING

The antioxidant effect of ascorbic acid is destroyed by enzymes in fresh cut fruit, but citric acid can inactivate the enzymes. A combination of citric and ascorbic acids, applied to the fruit by dipping, by sirups, or as dry acids with or without sugar, prevents browning better than larger amounts of ascorbic acid alone, and is cheaper. The more citric or other fruit acid employed, the higher is the retention of the added ascorbic, and the smaller quantity required to prevent discoloration. It may be possible to pack frozen fruit with no sugar and still have a nonbrowning product. —FOOD INDUSTRIES

New Waterworks Techniques

Latest methods reflect progress in design, filtration, pumping, water treatment, and corrosion prevention

To meet a 40-ft. variation in water-level in the reservoir, an Oklahoma filtration plant uses a 10-mgd. and a 5-mgd. centrifugal pump, each having associated with it a low- and high-power motor fitted with flexible connections. When the head becomes too high, the 2-speed large motors replace the small motors on the pump shaft, and the load is then carried up to its maximum specified head. This plant has pushbutton control for drawing water from 6 points into the sampling laboratory, and also uses an earthfill-dam settling basin for recovering the used wash water.

Of the 710 water-softening plants in operation, about 35% employ the zeolite process. Household units for softening water continue to gain in popularity. One district makes its own zeolite (which has 3 times the softening capacity of natural zeolite) by dropping solutions of sodium aluminate and of sodium silicate simultaneously into a mixing tank in a gantry which straddles fourteen 400-sq. ft. drying panels. Mixed for 30 sec., the gel is poured into the pans and is cut by wires on the traveling gantry before it has time to harden. Harvested into cloth sleeves by a suction lift, it is then screened.

To increase the flow in its gravity water tunnel from 75 mgd. to a possible 150 mgd., one district installed in the vertical outlet shaft of the tunnel a variable-pitch propeller. The pump is located off center of the riser shaft so that a combination access opening, bypass, and surge relief could be provided. Capacity of the pump is varied by local or remote changing of the angle of the blades which are rotated by a cross-head mounted in the propeller hub and powered by a hydraulically operated piston. In Chicago, to increase the capacity of a pumping plant without interrupting service, the problem of connecting the suction tunnel for the new pump with the existing wet well was solved by pouring a tremie concrete seal within a canvas bag against the inside of the well wall at the intake end of the suction tunnel. This seal, reinforced, withstood the hydrostatic pressure while the tunnel was drilled through the wall.

In joints for cast-iron water lines, neat screened portland cement, moistened to doughy consistency, cuts leakage to

ROCKET ENGINE—Weighing only 210 lbs. but developing 6,000 lb. of thrust, or about 8,000 hp. at 400 mph., a 2x4-ft. rocket engine unveiled by the Navy and Reaction Motors, Inc., is designed for supersonic aircraft. Alcohol and liquid oxygen are injected into the 4 cylinders and a 15-ft. flame shoots out. —BUSINESS WEEK

less than 25 gal. per in. diam. per mile per 24 hr. In underground pipelines, copper and its alloys corrode much less and more uniformly than ferrous materials; ferrous alloys with nickel and chromium are superior to other ferrous materials. Cathodic protection retards or prevents corrosion under most soil conditions. In Atlanta, a hot-applied, elastic film was used to rustproof and waterproof carefully cleaned surfaces of steel, cast iron, and concrete. Built up in two applications, the $\frac{1}{32}$-in. coating formed a dense, lasting bond.

A 106-ft. diam., 2-mg., all-welded spheroid water tank is partly supported by a 40-ft. fluted column designed to carry wind load. —ENGRG. NEWS-RECORD

ELECTRONIC BEARING SORTER

Ball and roller bearings are sorted into 5 size grades, plus "under" and "over" rejects, with a selectivity of 40 millionths of an inch and at a rate of 2 a sec., with the Pratt & Whitney Selectronic. Actuated by a feeler that touches the bearings as they roll under it, a Wheatstone bridge type of circuit operates, via an electronic circuit, solenoids which open stops to direct the balls into the proper size-classification bins. —BUSINESS WEEK

MAPIGATOR PERMITS ONE-HAND AVIGATION

Combining the functions of many instruments, the new Mapigator is designed for one-hand solution of navigational problems by the personal plane pilot as he flys. The map is inserted between a 14x16x$\frac{1}{4}$-in. white baseboard and a transparent sheet surfaced for erasable marking, this sheet being printed with a compass rose with which the map is aligned. A transparent disk with guide lines and concentric circles ruled on it is placed over the rose, its lines adjusted parallel to the map meridians, and thumbscrews tightened. The course is plotted on the cover-sheet with the aid of lines on the grid disk. By turning the grid on its pivot until two points are on or close to the same line, direction is read on the rose. The grid spacing also measures distance, and wind-triangle problems are solved with the aid of an adjustable wind arrow and concentric circles on the grid sheet. A standard computer attached to the board figures speed, time, and distance problems. A log has room for data to plan 3 legs of a flight. —AVIATION

ELECTRIC FISH SCREEN

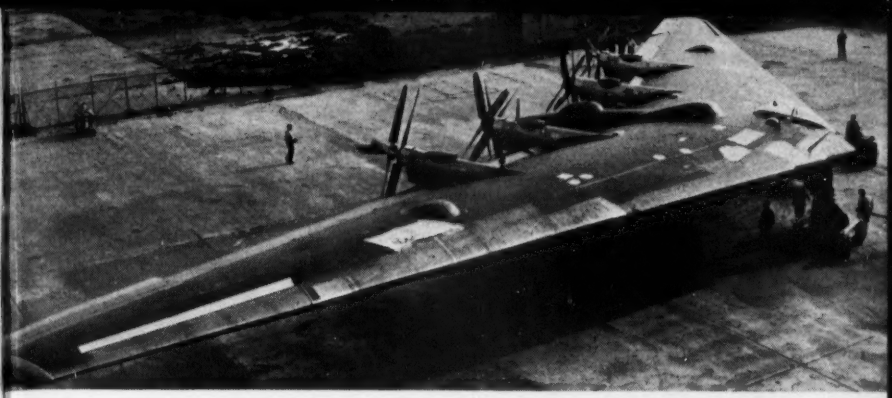
Rows of energized and grounded electrodes 18 in. apart are immersed in the water intake at Michigan City Generating Station. Impulses impressed on these at 300 to 600 volts by an electronic generator (5 per sec. when many small fish are running, 1 per sec. otherwise) produce a field in the water which scares, but does not harm, the fish. A 120-mf. condenser is charged with d-c through an adjustable (for timing) series resistance and discharged through the electrodes by a thyratron tube. —ELECTRICAL WORLD

CURES FOR MALARIA

Eventual eradication of malaria, which affects 800 million people, is promised by new drugs. Chemically related to the German Synthetic plasmochin, or pamaquin, the curatives are derivatives of a group of compounds known as 8-aminoquinolines. Three are important: cloroquin, oxycloroquin, and paludrine, each appearing potent enough to completely suppress malaria in single, well-tolerated doses. But it remains to be demonstrated that these do not cause hemolytic anemias. —BUSINESS WEEK

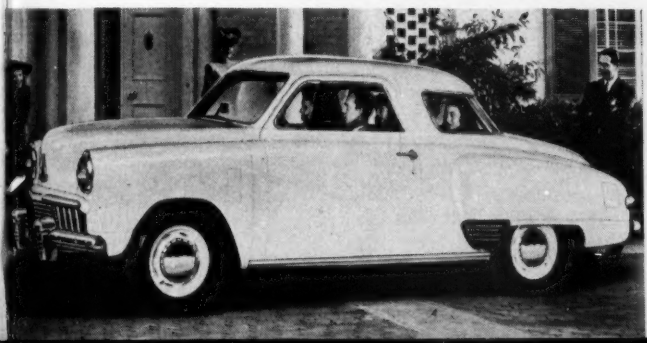
MOTOR-OIL CLINIC

The nationwide Faber Laboratories offers a prompt, mail-order, motor-oil analysis services for keeping delivery-fleet motors in good condition. At a charge of $1.18 per vehicle per month, the company accurately reports and records the impurities in samples of used oil, recommending the specific engine adjustments and repairs indicated by their findings. —FOOD INDUSTRIES



BIGGEST FLYING-WING—Long under secret development, Northrup Aircraft's long-range Flying Wing XB-35 bomber-transport carries 73,000 lb. yet weighs only 89,000 lb. (Northrup's engineers say a flying wing will carry ¼ more useful load than a conventional airplane.) The 172-ft. V-wing has an area of 4,000 sq. ft., and its lift-drag ratio is between 140 and 200 to 1 compared with 100 to 1 for the most efficient wing-and-fuselage ships. It is powered by 4 radial 3,000-hp. engines with 8-blade, counter-rotating, pusher propellers. Controls include "elevons" trailing the wing beyond the engine section and serving as elevators and ailerons; trim flaps and split flaps, serving as drag rudders and trailing the outer wing section; outer wing leading edge slots; and landing flaps. Costing about $13,000,000, the flying wing is the first of 15 such aircraft that will be built by Northrup. —AVIATION NEWS

GLASS-PLASTIC BODY—Wm. B. Stout has used plastic - impregnated Fiberglas in a rear-engine model car, the whole body being molded in one piece, with reinforcing bulkheads at dash and behind rear seat. The Fiberglas is 3-ply, 1/16 in. thick, with a tensile strength of 300,000 psi. Impact strength is claimed 10 times that of steel. Bumpers are Fiberglas on sponge - rubber cushions. Repair sections can be cemented in under a heat lamp. —AMERICAN MACHINIST



BETTER DESIGN—Studebaker's bodies are roomier, lower, more comfortable. Contour windows replace upper portions of rear-quarter panels. Body width extends to fender lines, with passenger space forward 19 in., engine 5 in. Self-adjusting brakes and a 2-section driveshaft with a "mid-ship" bearing are features. —AMERICAN MACHINIST

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